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VOL. 42, NO. 7

METAL FINISHING

PREPARATION, ELECTROPLATING, COATING

JULY, 1944

THE POST-WAR OUTLOOK

Various signs have recently been pointing to a position of comfortable security for the metal finishing industry during the period immediately following the war's end. The deterioration of an enormous number of articles, both essential and non-essential to our high standard of living, is too obvious to require substantiation and the public is being daily confronted with store shelves denuded of replacements.

Deterioration will continue but replacement production, in general, is not to be expected for the duration, despite some half-hearted attempts in Washington to relieve the shortages in some civilian necessities, such as electric irons, the lack of which cannot but effect war production.

Consideration of the products which will be in great demand after the war will indicate the reason for our optimism. Electrical appliances—broilers, toasters, irons, lamps, vacuum cleaners, washers; plumbing fixtures; refrigerators; radios; automotive hardware; cutlery; kitchen accessories; all these and many others too numerous to mention will require polished, plated, anodized, enameled, colored and lacquered finishes.

A gauge of probable future requirements is the survey recently completed by the American Hotel Association, representing the immediate needs of hotels for equipment and supplies. These needs include approximately three million floor, table and bed lamps, twenty-five thousand vacuum cleaners and eleven million dollars worth of silverware. Almost three thousand hotels require faucets and other plumbing items. And this is only a very small fraction of the requirements of only one industry.

When all this is considered, the post-war outlook for the metal finishing industry looks very promising indeed.

A.E.S. Conference Again

Maurice R. Caldwell
Supreme President

Walter L. Pinner
Supreme First Vice-President

Ray O'Connor
Supreme Third Vice-President

Frank Savage
Supreme Second Vice-President

Ellsworth T. Candee
Executive Secretary

The 32nd Annual Conference of the American Electroplaters' Society, held in Cleveland, Ohio, June 12th, 13th and 14th, broke all records for attendance since the founding of the Society with a registration of 1248, topping by over 300 the previous record of 917 established at the Buffalo Conference in 1943.

Naturally, war work held the limelight during the educational sessions with the subject of hard chromium plating producing the greatest interest, as would be expected.

The outstanding event of the conference probably was the Tuesday noon *Victory Luncheon* sponsored by *Frederick Gumm Chemical Company* of Kearny, N. J. *Hon. Fred A. Hartley, Jr.*, Congressman from New Jersey, was the speaker.

Election of Officers

Maurice R. Caldwell, of W. B. Jarvis Company, Grand Rapids, Mich., was elected Supreme President; *Walter L. Pinner* of Houdaille-Hershey Company, Detroit, Mich., was elected First Vice-President; *Frank Savage* of Conn Instrument Company, Elkhart, Ind., was elected Second Vice-President; *Ray O'Connor* of Contract Plating Company, Stratford, Conn., was elected Third Vice-President; *Ellsworth T. Candee* was appointed Executive Secretary.

All officers are very well known in the metal finishing field and have made important contributions to the science.

Conference City

The Pittsburgh Branch was awarded the conference for 1945. Montreal Branch will hold the first post-war conference.

eaks Attendance Record

George Wagner
Past Supreme President

Hobby and Curio Exhibit

Many interesting items were displayed at the exhibit during the conference. The awards were as follows:

Individual Exhibits

1st Prize: *George B. Hogaboom.*
2nd Prize: *Edward Proctor.*
3rd Prize: *Joseph Farmer.*

Company Exhibits

1st Prize: *Hanson-Van Winkle-Munning Company*, Matawan, N. J.
2nd Prize: *The Harshaw Chemical Company*, Cleveland, Ohio.
3rd Prize: *Divine Brothers Company*, Utica, N. Y.

Branch Exhibits

1st Prize: *Bridgeport Branch.*
2nd Prize: *Dayton Branch.*
3rd Prize: *Baltimore-Washington Branch.*

The Herminie Dorothea Proctor Award of $100.00

Awarded to *T. G. Coyle* of United Chromium, Inc., for his paper entitled "Porous Chrome Plating."

Founders' Gold Medal

Awarded to *Frank Savage* of Conn Instrument Company, for his paper entitled "Electroforming."

HONORABLE MENTION: *Arthur Logozzo* of MacDermid, Inc., for his paper entitled "Hard Chrome Problems." *Charles L. Zapffe* and *Charles L. Faust* of the Battelle Memorial Institute, also received honorable mention for their paper entitled "The Relations of Defects in Electroplate to the Gas Content of the Basis Metal."

George B. Hogaboom, Sr.
Winner of 1st Prize for Individual Exhibits

T. G. Coyle
Winner of The Herminie Dorothea Proctor Award of $100.00

Arthur Logozzo
Honorable Mention in Founders' Gold Medal Award

Dr. C. S. Lowe
Winner of $50 prize for Best Paper in the *Monthly Review*

Fifty Dollar Prize for Best Paper in the Monthly Review

Awarded to *Dr. C. S. Lowe* of Pennsylvania Salt Manufacturing Company, for his paper entitled "Precleaning with Solvent Emulsions" which appeared in the January, 1944, issue of The Monthly Review.

A. E. S. Gold Medal

Awarded to *W. S. Morrison* of Illinois Water Treatment Company, for his paper entitled "Synthetic Cation and Anion Exchange Resins as New Research Tools in the Field of Electro Deposition and Related Art," which appeared in the August, 1943, issue of The Monthly Review.

HONORABLE MENTION: *La V. Verzier* of the Lea Manufacturing Company, for his paper entitled "Glue for Polishing" which appeared in the October, 1943, issue, and *Jerome Black* for his paper entitled "Oxide Black Finishes on Steel" which appeared in the February, 1944, issue of The Monthly Review.

JOB PLATERS' LUNCHEON

Seventy-seven job shop owners and their representatives were present at the special luncheon held on Wednesday, June 13. The meeting was presided over by *Ed. Musick* who was ably assisted by *Adolph Bregman*, secretary of the *Master Electroplaters' Association* of New York.

The peculiar post-war problems of this industry were the main subject of discussion. Reports were furnished on the labor situation in various parts of the country, and the success of the New York Association in having the occupation of "Electroplater" placed on the critical list by the War Manpower Commission was brought to the attention of the group.

Ray O'Connor, of Contract Plating Co., Stratford, Conn., who was also elected third Vice-President of the *A. E. S.* for the coming year, was elected the new chairman of the job platers group.

In order to obtain more effective cooperation among job platers in various parts of the country and to permit full discussion of matters of interest, it was decided that additional time will be arranged for at the next annual conference, and an announcement will be sent out at the appropriate time.

International Fellowship Club

As usual the activities of the *International Fellowship Club* were very successful as all those who attended the Open House Monday night can testify. The club sponsored the Open House Meeting with a large number of organizations engaged in the production and distribution of plating supplies participating.

The annual Fellowship luncheon was held at noon on Monday when officers for 1944-5 were elected. The elections were: Chairman—*Frederick Gumm*, Frederick Gumm Chemical Company, Kearney, N. J.; First Vice-Chairman—*W. Douglas MacDermid*, W. D. MacDermid Chemical Company, Bristol, Conn.; Second Vice-Chairman—*Robert W. Renton*, Lea Manufacturing Company, Waterbury, Conn.

Thomas A. Trumbour was continued in the office of Permanent Secretary.

Frederick Gumm
Chairman

W. Douglas MacDermid
First Vice-Chairman

Robert W. Renton
Second Vice-Chairman

Thomas A. Trumbour
Permanent Secretary

Plastics in the Plating Industry

By HAROLD NARCUS

Chief Chemist, Plating Processes Corporation, Holyoke, Massachusetts

Introduction

THE material in the following paper has been compiled with one purpose in view, namely, to present the electroplater with an insight into the field of plastics which today is playing such an increasingly important role in this expanding industry.

The plater is continually confronted with the problem of masking parts for localized deposition as in salvage work or in preparing parts for localized hardening. In addition, it is frequently necessary for him to stop-off plating racks to increase their life and efficiency besides conservation of critical metals needlessly deposited on these racks. Proper coatings for plating tanks are also commonly considered his responsibility. Furthermore, he is faced with the task of plating on plastic materials, a process used for relieving the acute shortage of base metals and for functional purposes. This procedure is increasing in importance but is also presenting the plater with many new problems. It is also evident that many of the present-day plating supervisors are connected directly or indirectly with organic finishing in some capacity.

With the above in mind the writer would like to attempt to clarify many confused ideas regarding plastics and the plastics industry which the plater may possess, without probing too deeply into the field of organic chemistry. It must be remembered that the field of plastics is a tremendous industry with new developments occurring daily and an industry about which volumes could be written. It is hoped, however, that the presentation of this paper will give the plater an impetus to investigate a new series of organic materials, employment of which will produce better work more rapidly and economically.

Plastics Classified

Organic plastics, in most cases correctly termed "synthetic resins," are moldable materials manufactured from organic compounds which are combinations of carbon with hydrogen, oxygen, nitrogen, and other elements. These plastics are members of that vast group of materials which are readily responsive to shaping influences, such as pressure in the presence of high temperatures—materials which maintain their new form when the shaping influences are ultimately removed.

The general types of organic plastics to be discussed in order of their importance to the plating industry are as follows:

I. Synthetic resins including the cellulose derivatives
II. Natural resins
III. Protein derivatives

Before investigating the above classifications more specifically, it would be advisable at this point, for the sake of clarification, to subdivide plastics still further, as below:

A. Thermoplastic resins
B. Thermosetting resins

The first group embodies those which are softened—molded or shaped by pressure, with the aid of heat or without it, and whose final hardened shape can be re-softened by heat or, in other words, re-molded. The second group represents those which, in their original condition, flow and can be molded by heat and pressure but which, once in their final state or so-called "cured" condition, cannot be re-softened or re-molded. Familiar members of the former category of materials are "vinyl" resins, "styrene" resins, "acrylic" resins, cellulose compounds, and the increasingly important synthetic rubbers. The thermosetting resins include the phenol-formaldehyde resins, urea-formaldehyde, and melamine-formaldehyde resins.

Synthetic Resins—Thermoplastics

The first previously mentioned general group of resins—the synthetic resins—are perhaps the materials which are mostly used in the plating industry at the present time. In opening the discussion of the substances in this classification let us begin with the synthetic materials which are thermoplastic.

The resins which the writer has found to be of utmost importance in the field of hard chromium plating are the "Vinylite" copolymer resins. They possess extreme chemical inertness and are unaffected by alkalies, oxidizing agents and most inorganic acids. Water, alcohol, grease, fats, or aliphatic hydrocarbons have no effect on them. They are, however, swelled by chlorinated hydrocarbons and other organic materials such as ketones (acetone, methyl isobutyl ketone, etc.) and aldehydes besides certain organic acids. In sheet form the "Vinylite" plastic is tough, highly resistant to tearing, abrasion, and scuffing. It is very elastic and can be stretched to 200-300% of its original length. Because of their low water absorption and their lack of physically incorporate plasticizers the "Vinylite" copolymer resins are dimensionally stable and will not warp or shrink on aging or under varying conditions. They may be shaped under heat as desired. This property is very advantageous in utilizing this material for masking for hard chromium or heavy nickel plating.

The copolymer resins are also used for surface coating applications. The polyvinyl chloride solutions, in particular, make up the basic ingredient for excellent "stop-off" lacquers in electroplating or for making metal surfaces chemically resistant. Of particular importance are thin coatings applied to iron to replace materials such as tin plate, galvanized iron, aluminum, and other strategic or critical supplies no longer readily available.

When the polymer resins are applied from solution in organic solvents they yield a tough, glossy, chemically resistant coating upon baking. Because of their flexibility, toughness and adhesion, they can be used as finishes on sheet metal which is to be fabricated after being coated. Parts may be stamped, spun or drawn from the coated sheet without any cracking or rupturing of the film.

In the plating room care must be taken not to subject the film or Vinylite sheet employed to high tempera-

Temperature controlling instrument with plastic covered lead and plastic protective well.

tures as it has a relatively low softening point (approximately 158°-160° F.).

Vinyldene chloride resins have aroused considerable interest because of their unusual properties, namely, water, chemical and solvent resistance besides toughness and durability. They are suitable for many difficult industrial applications. In the plating room this synthetic resin in tubing form is excellent for covering lead wires and metal tubing connecting thermal control instruments and other wires leading to voltmeters and ammeters insuring the wires against the corrosive action of the electrolytes or particularly against the spray from gassing of parts in the electrolyte as in chromium plating. Molded fittings made from this material replace those formerly made of brass and copper—metals which are most critical. It is also used for coating plating racks and for making lacquers and corrosion-resistant tapes.

The advantages of this resin are a relatively high softening point (240°-280° F.), case of machining, non-inflammability, high tensile strength, high fatigue and abrasion resistance and high dielectric properties.

The polyvinyldene chloride resin is known to the trade as "Saran" and is made in practically all forms such as rods, tubing and sheet.

Other resinous products similar chemically to the "vinyl" resins just discussed, by virtue of the presence of the so-called unsaturated vinyl radical ($CH_2=CH—$) in their molecules, are the styrenes. The primary styrene has the formula $C_6H_5CH=CH_2$. These resins find use in various metal lacquers and light colored enamels. They dry smoothly without cracking and have a high lustre. Their hardness and plasticity compare favorably with the phenol-formaldehyde resins and in massive form they are somewhat stronger. When better synthetic methods of producing styrenes are available these resins probably will be of greater importance.

The polystyrene resin is a highly thermoplastic molding material with high insulating properties, moisture resistance, inertness, dimensional stability because it contains no plasticizer, and high impact strength. It is soluble in cheap solvents and coatings of polystyrene are quick-drying, resistant to water and moderately so to acids and alkalies employed in the plating room.

Because of its low specific gravity (Sp. Gr. 1.04) cubes of polystyrene can be readily used to float on the surface of plating solutions which are not operated at too high a temperature, for keeping spray from entering the atmosphere of the plating room as in chromium baths or iron baths operated at low temperatures. Polystyrene should not be allowed to come in contact with high temperatures, for example above 175° F. (as in alkaline cleaners) for too long a time as it will tend to soften under these conditions. "Loalin," "Lustron" and "Styron" are well known members of this group of thermoplastic materials.

A relatively new type of resin which first appeared on the market in 19[illegible] and which attracted the attention of the optical industry because of its amazing optical properties is the "acrylic" resin. It is clearer than glass and has assumed great importance as an "organic glass."

The poly-methylmethacrylate resin known to the industry as "Lucite," "Plexiglas" and "Acryloid" is one of the most used of the acrylic resins. This substance has a high softening point and is capable of being immersed in boiling water for short periods without distortion. It is also characterized by its elasticity and remarkable impact strength.

Coatings made from this resin have good insulating properties. They are used for hard, heat-resistant enamels and for solvent-resistant finishes for metals. They are particularly employed in the white enamels because they will not discolor when maintained for long periods of time at temperatures as high as 500° F. and also as fume-resistant enamels. In general they are compatible with nitrocellulose.

The poly-methylmethacrylate resin has found excellent use in the plating room on safety-goggles and hoods when handling corrosive liquids and during burring operations. Its resistance to both weak and strong alkalies and acids is excellent. It is highly resistant to mineral, vegetable and animal oils. At a mid-western plant "Lucite" is being used for a new rapid method of hard chromium plating of bomber landing gear pistons. Tubing of this plastic is being used as a protective shield over the end of the piston during plating. This protective shield also prevents uneven plating along the piston. The plastic withstands the cleaning cycle solutions and chromium plating bath during the entire operation without signs of deterioration. Unfortunately vapor degreasing is not possible.

Plastics derived from cellulose were among the first to be developed. The most important example, celluloid or xoxolin, is made by compounding ellulose nitrate with camphor but ecause of its high inflammability it s been partly displaced by other ellulose materials with which the fire sk is less great. However, because ellulose nitrate plastics are among the est of the cellulose compounds curently manufactured and, because of eir prominence in lacquers used in e plating and synthetic finishing instry, it would be in order to discuss em before the other cellulose comounds.

Cellulose nitrate is often called itrocellulose" which is a misnomer ecause there is not complete nitration. w viscosity cellulose nitrate is used a base material in a great many stop-fs employed in electroplating. In ocessing this material it is possible vary the final properties of the ulti-te product by regulation and con-l of certain conditions during and er the nitration process. By means this procedure it is possible to pro-ce different grades which will pro-ce various viscosities of solution en the basic cellulose nitrate is dis-ved in the proper solvents. Thus, amounts of solids or film-forming terial can be controlled and should high for best results in stop-offs. sins are incorporated into the lac-er for certain desirable properties. tural resins, which will be discussed er in the article, can be used and sometimes employed. They im-ove the adhesion and gloss of the al product and reduce shrinkage. nthetic resins of the phenol-formal-hyde type, rosin-glycerol, and sebacic id-glycerol resins can also be em-oyed. Plasticizers are used to make resulting film flexible and pliable, ssess greater adhesion and even ss. Castor oil and dibutyl phthalate typical examples. Pigments are ten incorporated in the final product.

The cellulose nitrate lacquers in eir complete form dry readily at om temperature by evaporation of solvents. Forced drying may be ed at about 180° F. The resulting ting is tough and durable. The advantages of this type of film is its flammability and tendency to become rd on aging and to discolor and come brittle on exposure to light.

Another product which has found wide use in the electroplating industry is Plastic Wood which is made by mixing cellulose nitrate with wood flour. This material is used very advantageously in salvage work necessitating the stopping-off of keyways, slots, splined areas, center-holes, etc. It is usually advisable to top the plastic wood with an ample coating of stoff-off lacquer to insure against its disintegration in the plating bath. This is particularly necessary in the case of hard chromium plating.

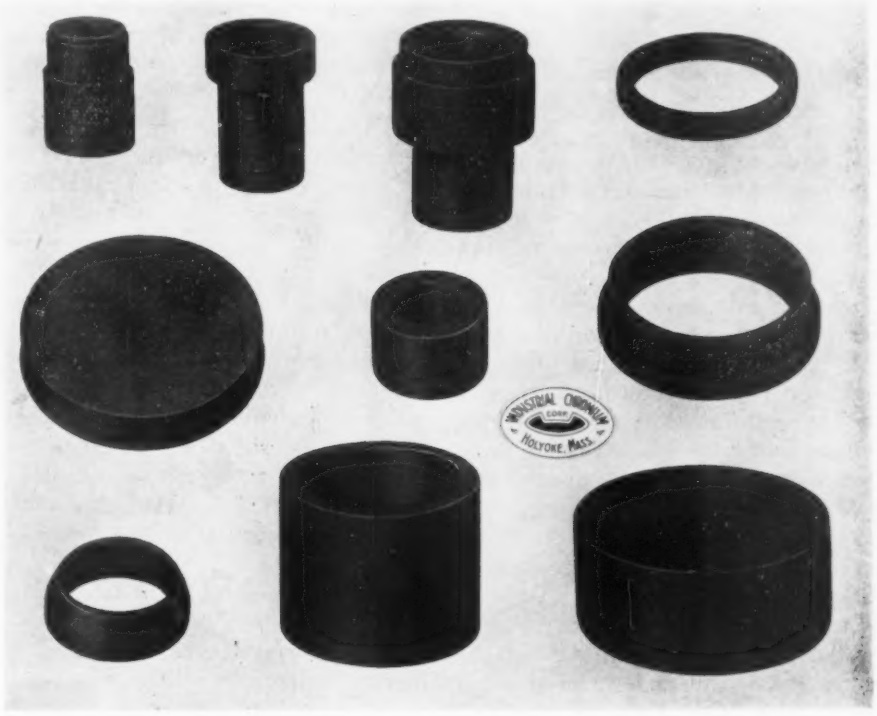
At the present time, wherever possible, cellulose acetate plastics have replaced those made from cellulose nitrate to a great extent. They belong to a large family of cellulose derivatives which also includes the butyrates and ethers of cellulose called ethyl cellulose. In the United States the development of these materials is attributed to the enormous availability of the basic raw material, cellulose.

The cellulose acetate plastics are typical representatives of the thermoplastic group of materials. Mechanical strength and toughness are the outstanding characteristics of the acetate plastics. The present metal shortage has been relieved by utilization of the cellulose acetate plastics, especially in the hardware industry. Even in peace time there are many hardware articles which will continue to use these plastics in their make-up. Some examples are door-knobs, escutcheons, drawpulls, faucet handles and scores of other items. The plater will in many cases be called upon to electroplate these articles in order to obtain certain properties of the outer metal.

Some trade names which represent cellulose acetate are "Lumarith," "Plastacele," "Fiberloid," and "Tenite I."

Cellulose acetate butyrate resembles cellulose acetate closely. It has excellent dimensional stability and low water absorption. At the present time decorative strips of aluminum, copper, brass, nickel, and chromium plate have been displaced by extruded cellulose acetate butyrate in wall-board trim, counter nosing and edgings, weather stripping and in innumerable other applications. It has fairly good resistance to all plating solutions even chromium plating electrolytes if not subjected to the solution for too long a time or at too high a temperature. "Tenite II" and "Tulox," which are cellulose acetate butyrates, are familiar names to the trade.

Another member of this category of materials is ethyl cellulose which is widely used as a base material for plastics and especially coatings because of its solubility in cheap solvents and compatibility with a wide variety



Miscellaneous plastic shapes machined to properly fit areas required to be stopped-off.

of modifying agents such as resins, plasticizers, oils and waxes. The coating has heat resistance in addition to good thermoplasticity, does not readily age, has low inflammability, and good electrical insulation properties. Lacquers made from this material can be brushed, sprayed, or dipped on the part. As in the case of the vinyldene chloride resin, previously discussed, ethyl cellulose plastic fittings are being used to replace scarce copper and brass fittings and to decrease the weight of these parts. It is perhaps the lightest of the cellulose products on the market. Among its outstanding properties are its resistance to low temperatures and water, its toughness and high impact strength, and its dimensional stability. It is also resistant to both weak and strong alkalies. It possesses good electrical characteristics and ease of fabrication. "Ethocel" is a well-known trade name for this material.

Thermo-setting Resins

The phenol-formaldehyde resins bearing the trade names "Bakelite," "Catalin," "Micarta," etc., are probably more widely known to the plater than any other plastic compound. The formation of a resin from these basic chemicals may result in fusible or infusible products, depending upon whether the catalyst used is acidic or alkaline in nature. When acid catalysts are used the product is permanently soluble and fusible and is the type of resin used in varnishes and lacquers. When alkaline catalysts are employed the reaction ultimately produces a product used in the molding industry.

Molding, casting, and laminating are the three general methods for obtaining products from this type of resin. For use in molding compositions the resins are strengthened with fillers which not only reduce the cost, but also by proper choice, furnish desirable qualities to the finished product. Wood flour, when properly incorporated, gives a resulting resin having suitable flow with less shrinkage and greater toughness. Finely divided asbestos is used when resistance to heat is essential. Powdered graphite filler is used for low friction products. "Bakelite," "Resinox," and "Durez" are examples of phenolic resins (molding type). These resins are resistant to the atmosphere and chemical corrosion, have fairly light weight, low heat conductivity, high structural strength, and excellent electrical insulation. They stand up well in most plating baths and alkaline cleaning solutions specifically to a large degree in nickel plating baths but only fairly well in chromium plating baths, especially when not subjected to the bath for too long a time. At this point it would be well to remark that when using plastics as stop-off materials they are not subjected to as severe attack as when they are used permanently in the electrolyte, as in tank construction parts. This type of resin also has excellent resistance to ketones, esters, and to aliphatic and aromatic hydrocarbons in addition to animal, vegetable, and mineral oils.

In constructing racks where certain parts of the rack merely serve as supporting platforms for the work and there is no need for a current-carrying medium at this part of the fixture, the phenol-formaldehyde resin is excellent because of its relative rigidity or non-compressibility.

"Catalin" is a member of the group of phenolic resins known as the "cast" type. This type usually contains a larger percentage of formaldehyde than the preceding resin and usually does not employ fillers. The resin is poured in a sirupy state into molds. A slow baking causes a hardening of the mass. Catalin has about the same efficiency in the plating room as Bakelite when used for short lengths of time in the electrolytes, especially chromic acid, but the writer has observed that it withstands the action of chromic acid electrolyte to a greater degree than Bakelite.

When the phenolic resins are used as binders for such substances as cloth or paper, a third type results, known as laminated phenolics to the trade. This type is hard, dense, and possesses excellent mechanical and dielectric properties. It finds an excellent place in rack construction, when the racks are used in electrolytes which are not too harsh to the material. "Micarta" is a representative of this type of phenolics. It is used to a great extent for insulating the anode from the cathode in certain set-ups for hard chromium plating when auxiliary anode construction is required.

A new process of great interest to the plater has been developed, employing the formaldehyde resins in a unique manner. It utilizes these synthetic resins as cation and anion exchange resins in water treatment. They are known to the trade as "Amberlites." By use of this process it is commercially possible to produce quantities of water free from soluble salts economically. As low as 2-5 parts per million of soluble salts has been attained. The process bears close investigation especially by the silver plating industry. It may be possible to economically recover precious metals such as gold and silver from waste rinse water when they are present in low concentrations.

The urea-formaldehyde and thiourea-formaldehyde resins are increasing in importance commercially. They are the most common of the resinous substances obtained by the action of amines on aldehydes. They represent the lighter colored type of resin. This type of resin is used in baking enamels which are among the few that show excellent adhesion to electrodeposited chromium. The films obtained are chemically-resistant and inert. Corrodable metals, when coated with this film, will successfully withstand moderately strong acids and alkalies. It is also impervious to salt spray and shows excellent adhesion to the metal under a variety of baking schedules. It can be mixed with fillers, as in the case of phenol-formaldehyde resins, and may be used for impregnation of paper, cloth, and wood for laminated products. It possesses good electrical properties. These amino-formaldehyde resins in general possess a rigid hard surface, show excellent light diffusion and are electrically "non-tracking." "Beetle" and "Plaskon" are the trade names assigned to these plastics on the market.

Melamine-formaldehyde resins and compounds were made available commercially in the U.S.A. about 1939. In laminated products the melamine-formaldehyde resins have high heat and abrasion resistance, surface hardness, general inertness, and resistance to organic solvents, acids, etc. They are employed in the manufacture of certain baking enamels which produce hard and chemically resistant coatings. The resins are compatible with a relatively wide range of pigments, solvents, and other resins. Melamine-formaldehyde resins have important application in terminal blocks and electrical parts such as circuit breakers. "Catalin," "Melamine" and "Melmac" are examples of this type of resin in industry.

(To be concluded in August)

Indium and its Electrodeposition

By MARCUS A. WHITEHEAD

Development Engineer, American Smelting and Refining Co., Barber, N. J.

INDIUM is one of the Cinderella metals that has become a Princess due to the war and in so brief a time that the general public, preoccupied otherwise, has not kept pace. Therefore some of its properties and methods of application are given at this time.

Indium was discovered by F. Reich and Th. Richter in 1863 in the zinc blende of Freiburg by detection of the indigo blue line (Lambda 4.511) in its spectrum. It is one of the very rare elements and was known for many years to occur only in small quantities in zinc blende. The first indium mine has yet to be discovered, but in the last few years its presence has been found in other ores although in very minute quantities. Methods of extraction have been found possible so that certain of the very largest smelters and refiners of non-ferrous metals have succeeded in winning enough of it, mostly from American ores, to create a constant supply of metal sufficient to satisfy a growing demand. It is not on priority. The price for such tiny amounts as were required by science, up to ten years ago, was as high as $100 per gram. Today, with new uses constantly being adopted, suggested and explored, the price has been reduced to around $10 per ounce troy.

It is a very soft metal, having a Brinell number of less than 1 (.85) and it is very malleable. Its atomic number is 49 and its atomic weight is 114.8. In the Periodic Chart of the atoms it is in the third periodic group containing aluminum, gallium and thallium. Its melting point is 155°C. and its boiling point is well above 2000°C. Its specific gravity is between 7.2 and 7.42 and its specific heat 0.05695 Calories/gram/deg. C. between 18°C. and 100°C. There are many compounds of indium, the best known being indium trichloride, $InCl_3$; indium sulphate $In_2(SO_4)_3$; and indium sesqui-oxide, In_2O_3.

Indium in Bearings

Probably nothing has given as much of an incentive to interest in and the increased use of indium than the absolutely vital necessity for better aircraft engine performance in the present war. Copper-lead, cadmium base and other alloy bearings are greatly improved by plating their surfaces with a very thin layer of indium (about .0001")[1] and subsequently diffusing it into the underlying bearing metal at elevated temperatures. In service, bearings so treated show a striking decrease in rate of corrosion caused by some lubricating oils under certain operating conditions. It is not possible, due to war conditions, to gather or discuss performance results of the engines of all types, particularly aircraft, used to power the various types of equipment used by our Military or Naval forces since they are properly and necessarily surrounded by secrecy. It can be said, however, that indium is being used successfully in the best equipment of all of the United Nations armed forces.

The depth of diffusion of indium coatings into lead, cadmium, copper, silver and certain alloys at 150°C. for 500 hrs. and at 120°C. for 200 hrs. has been studied by Smith[2]. In all cases it was found that the concentration of indium at the surface remains relatively high even after the more drastic diffusion experiments. Since even as little as 0.37% indium alloyed with cadmium - bearing metals markedly decreased the rate of corrosion in acidified lubricating oils, data indicate that extremely long periods would be necessary before diffusion would progress to such an extent that the indium content at the surface would be below this amount, assuming that the weight of the indium is less than 0.4% of the weight of the basis metal.

Since cases are known of very successful test results in internal combustion engines on lead base bearings, which have been plated with indium in the same manner and relative thicknesses as the bearings of Smith's studies, which were never heated to accelerate diffusion, it is quite likely that future studies of diffusion of indium into bearing surfaces at room temperature will reveal that no treatment to accelerate diffusion is necessary in commercial practice.

The Pratt & Whitney bearing has been fully described by Bregman[3] as follows:

"Ag bearings made by electrodeposition have been found satisfactory for heavy-duty applications. The seizure-resistance value of the Ag bearing was calculated at 115% compared with 100% for an alloy containing 28% Pb, 1% Ag, rest Cu and 75% for an alloy of 25% Pb, .3% Sn, rest Cu. Electrodeposited Ag was rated at 165% in relative seizure resistance compared with 140% for double-refined Ag, remelted, and 80% for double refined Ag, deoxidized with 0.15% phosphor-Cu. Oiliness of the Ag bearing can be improved by addition of a small amount of Pb to the Ag and by blending the oil with an addition agent to wet the surface of the Ag. A bearing which has found wide use in airplane motors is a composite product consisting of a pure Ag facing on a steel back. The Ag facing is first sand blasted, then plated with a thin deposit of Pb, followed by a thin deposit of In. After heat-treatment this bearing has the requisite oiliness which is sometimes missing from the pure Ag bearing. The Ag-Pb-In bearing has a very high load-carrying capacity, a high resistance to fatigue and is more resistant to corrosion by oil than are some of the other types of bearings. The heat-treatment following the deposition of indium may be carried to the point where the In melts and maintained at this point until all visual evidence of In plating has disappeared. 170° for 2 hrs. is sufficient to cause the In to impregnate the Pb to produce a corrosion and erosion resisting alloy or solid solution mixture which still retains the excellent oil-wetting and anti-friction qualities of a pure Pb surface. Except for ease of bonding, the Ag-Pb alloys have the best over-all

bearing properties, and the alloy which gave best results contained 3 to 5 Pb, and the rest Ag. The important disadvantage of the Ag-Pb alloy is the difficulty of bonding it to the steel back. Best results are obtained if the alloy is applied by electrodeposition."

Applications

There have been many other interesting uses for indium proposed and explored with great promise. Indium-silver and indium-chromium finishes on such post-war automotive equipment as bumpers, trim, handles, radiator louvres and lamps, will probably be much used due to the claim that such finishes are capable of taking a very high polish, are stable, resistant to corrosion, abrasion, tarnish and wear. These finishes are highly decorative and will most likely be used also on metal furniture, kitchen utensils and household articles of all sorts, including plumbing fixtures and other building hardware such as locks, hinges, doorknobs and fittings of other kinds.

Although the coefficient of friction of indium has not been evaluated, it is so soft and slippery that it has a graphite-like smoothness and grease-like nature. The use of a very thin plate of indium on a metal surface requiring lubrication might very profitably be explored where a lubricant is required that will change its viscosity only slightly under extremes of heat and cold.

Indium may be used to entrap and hold a film of oil to a surface of steel or other metal from which it might otherwise run off in too short a time by taking advantage of its softness. When first plated, indium has a matte finish which microscopically has the appearance of a forest of tiny "trees", in which oil can be retained by capillarity. When rubbed even very lightly these "trees" are laid flat, entrapping much of the oil beneath them and permitting the remainder to very slowly squeeze out, keeping the surface lubricated for a considerably longer time than it would on a surface not so treated, after which it provides some lubrication of itself.

Indium has been proposed as an inhibitor of corrosion by making use of this butter-like quality in closing up pinholes in the plated surfaces of other good corrosion resisting metals. The surface to be protected is first plated with an electrodeposit or hot dip coating of, let us say, zinc. Over this is deposited a thin coating of indium. The surface is spread by rubbing and the indium smeared and polished. The pinholes are thus filled up and the surface subsequently becomes alloyed by diffusion. The combination is said to show remarkable results against salt spray, erosion and abrasion. Since indium is plated at room temperature, no destruction of the temper of the underlying metal can take place. Also, since the plating time required for the thin coating of indium is very short indeed, seldom being more than 3 to 5 minutes, with the plating methods hereinafter described, danger of hydrogen embrittlement and loss of strength in the underlying metal, should it be steel, need not be feared. The indium lends itself to paint and lacquer finishes very satisfactorily and if the same use is made of the matte surface to hold the paint as with oil, perhaps noteworthy results could be obtained.

Considerable work on the alloys of indium has been carried on during the past five or six years but so far only a few commercial applications have resulted from these researches. Copper can be hardened by the addition of indium, 15% imparting a Brinell hardness of 250. While this equals beryllium-copper, the cost per pound of such an alloy at the present price of ingredients would be about $16.50. Since it is no improvement over beryllium-copper, which costs only approximately $1.00 per pound its use is uneconomical. Certain experiments have been carried out in alloying indium with gold, palladium, platinum and other precious metals but as yet nothing of particular interest has been developed. Approximately 50% added to gold, turns the metal a blue-white, but embrittles it to the point that it cannot be worked effectively. 66% indium and 34% bismuth make an alloy costing $75 per pound whereas an alloy of similar low melting point that could be used for sprinkler heads, etc., would cost but 75c per pound (lead-bismuth-tin-cadmium). Small amounts (0.10%) of indium added to certain age-hardening aluminum alloys considerably alter the rate and magnitude of the age-hardening phenomena i. e. it slows up the rate of hardening and increases its maximum.

Indium has been used to plate electric switch points where its softness, when plated on copper or silver permits instant contact somewhat comparable to mercury. The conductivity of indium is ten times greater than mercury and is approximately the same as nickel or platinum. Copper and silver are, of course, six times as good as indium.

The physiologic properties of indium and its compounds have been very ably explored[4]. Metallic disc implantations of fine and sterling silver 1.87 cm. in diameter, some coated commercially with indium and some uncoated for control purposes, were made in rabbits and studies made periodically for 156 days. It was found that, within the limits of experiments made, implanted metallic indium is without grossly discernable local or general effects and that no industrial applications of indium were known to introduce injurious exposures for workers.

Indium Plating

Indium may be applied by electroplating successfully to nearly all metals and alloys, such as rolled or cast iron, steel, stainless steel, cadmium, nickel, copper, brass, bronze, tin, silver, lead, antimonial lead, solders and babbitt metals.

Indium plating is very simple because it lends itself to a multiplicity of methods of plating, in contrast to many other metals such as chromium for which there is only one.

There have been proposed and used to some extent commercially some different methods of plating indium. The best known baths are:—

1. *Cyanide*: Prepared by adding excess sodium cyanide to a solution of indium chloride.

2. *Sulphate*: Consists of indium sulphate with the addition of a small amount of sodium sulfate.

3. *Sulfamate:* The main constituent of this bath is indium sulfamate.

4. *Alkaline:* Prepared by adding sufficient excess sodium hydroxide to a solution of an indium salt so that the indium is kept in solution.

5. *Tartrate:* This and *similar* baths are prepared in the following manner —Ammonium hydroxide is added to a solution of indium chloride until precipitation begins. The precipitate is then dissolved with an excess of some weak organic acid, such as tartaric, formic, oxalic, citric, etc.

As far as is known at present, the baths which are more commonly used

in industrial plating are the cyanide and sulfate. In the present discussion only the baths now known to be in use in large commercial production will be described in detail.

Cyanide Bath

The indium cyanide bath[5] is most commonly used in approximately the following composition:—

Indium (as chloride)	4	tr. oz./gal.
Dextrose	2	av. oz./gal.
Sodium cyanide	12	" "

The bath is prepared by adding the required amount of H_2O to a concentrated indium chloride solution in which form the indium is usually sold. Sodium cyanide is then added. It has been found that the straight indium cyanide solution tends to decompose in time, precipitating a basic indium salt whose exact composition has not been determined. It has been reported that the addition of dextrose or certain weak organic acids retarded the decomposition of indium cyanide. Dextrose is most commonly used in industrial work and it has been found that ½ gram of dextrose per gram indium content of the bath is the most satisfactory combination. Even with the use of dextrose, a slow decomposition of the indium cyanide takes place and the dark brown decomposition product must be filtered off and processed for the recovery of indium values. The indium cyanide bath may be operated at a cathode current density of from 10 to 150 but is usually carried out at 35 amps./sq. ft. The cathode current efficiency seldom exceeds 50%. In actual operation, the bath requires more or less frequent analyses of the indium content as it must be replenished when it falls below 1.5 troy oz. per gal. Insoluble anodes, usually platinum, stainless steel, or carbon are employed and replenishment of the solution is accomplished by the addition of concentrated indium chloride solution.

The throwing power of the cyanide bath is very good. Glass, glass-lined, rubber-lined or steel plating tanks are necessary for indium cyanide solutions. Power consumption is a minor factor in indium plating in general as it makes up only a very small percentage of the cost of this plating operation. In general, power consumption will work out to be approximately the same in all the various methods.

Sulfate Bath

The indium sulphate plating bath has the following composition:

Indium (as sulfate)
2.4 tr. oz./gal. minimum
Sodium sulfate
1.25 av. oz./gal. approx.

Preparation of bath:—Add the required amount of water to a highly concentrated indium sulphate solution in which form the indium sulphate is available commercially. The sodium sulphate is then added. The pH of the solution is adjusted to between 2.0 and 2.5 by the addition of sulfuric acid or sodium hydroxide as required. The solution is quite stable and will keep indefinitely as long as the pH is not allowed to rise appreciably above 2.8.

The bath is operated at a cathode current density of approximately 20 amps./sq. ft. The cathode current efficiency, which will vary somewhat with the pH, is generally between 70% and 80%.

In continuous operation, indium anodes are used as the means of replenishing the In content of the bath. Since, however, the indium anode efficiency is 100%, it is preferred that a combination of soluble indium anode and insoluble anode be used in such proportion that the indium content of the bath is maintained at a constant value. Platinum and graphite are suitable as insoluble anode materials. Maintenance of the bath is exceedingly simple. In actual operation all that is necessary is an occasional determination of the pH, which should not be allowed to rise above 2.7 nor fall below 2.0. Adjustment of the pH, if necessary, is made by addition of sulfuric acid or sodium hydroxide as required. If the combination of soluble and insoluble anodes is employed the indium content will seldom, if ever, require adjustment. Actually the bath will operate satisfactorily at any indium concentration above 2.4 tr. oz./gal. but it is inadvisable for economic reasons to allow the indium content of the bath to become greater than is necessary for satisfactory operation.

The throwing power might be called poor. However, objects of complicated shape are evenly plated without difficulty if the shape of the anode is made to conform approximately to that of the object to be plated. The largest industrial use of indium today is in the plating of bearing surfaces. An object of such simple shape presents no problem in throwing power to the practical electroplater.

Tanks and containers are glass, glass-lined, rubber-lined, lead-lined, mastic-lined, acid-proof ceramic, or of brick construction lined with mastic, lead or various synthetic compositions available. In these days of critical shortages in some structural materials, the availability of lead without priorities is a notable advantage.

Note: As for temperature, both baths are customarily operated at room temperature.

Preparation of Work

Nothing has been said so far about the preparation of the basis metal before plating as this very important part of the plating technique remains the same, regardless of the plating method employed. Freedom from dirt, grease and oxide films is essential for proper plating. The surfaces should be first wiped and then degreased in an organic solvent. The last traces of grease may be removed by immersion for a suitable time in a hot alkaline cleaning solution, the composition of which may vary with the nature of the metal surface to be cleaned. In general, bearing alloys should not be subjected to the action of very strong alkalies or they may be too deeply etched. A cold water rinse follows the alkaline cleaning.

Most non-ferrous metals may be indium plated immediately following this cold water rinse. Aluminum and magnesium, as well as iron and steel, usually require further treatment. Common practice is to subject aluminum and magnesium to a slight etch in 3% hydrofluoric acid, following which they are given a quick cold water rinse and immediately immersed in the plating bath. Iron and steel are given a conventional hydrochloric or sulfuric acid pickle prior to plating.

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RAPID SILVER PLATING

R. A. SCHAEFER* and J. B. MOHLER†

Abstract

A NEW high pH cyanide silver bath was developed for the rapid electrodeposition of silver at a cathode current density of approximately 100 amperes per square foot. The bath was found to give a dense and ductile deposit and consumed a small quantity of chemicals per pound of silver deposited under rapid plating conditions.

Cast silver anodes of approximately 99.9% purity were used. These anodes were neither cold worked nor annealed and the electrolyte was found to be less sensitive to anode impurities than the conventional silver plating baths.

Introduction

The excellent mechanical properties of silver have suggested its use as a bearing metal[1]. The first important work on electrodeposition of silver for this purpose was done by Mathers and Gilbertson[2] who studied the adhesion of thick silver deposits on steel. Continuing this work, Crosby and Gilbertson[3] have pointed out that the bond between steel and silver is independent of any mechanical interlocking but is dependent on the intra-atomic bond between the crystals of ferrite and silver. Further, the investigations of Simon and Lumley[4] showed that silver could be deposited at current densities as high as two hundred amperes per square foot by applying vigorous agitation to the plating bath.

Since the electrochemical properties of copper and silver are somewhat similar, it was thought that most of the principles associated with the high efficiency copper bath would also apply in the electrodeposition of silver. With this thought in mind the following variables were studied[5].

a. High metal content
b. Low free cyanide
c. Alkali hydroxide
d. Agitation
e. Temperature
f. Addition agents

Experimental

In order to develop a practical and rapid plating process, a deposition rate of approximately twelve thousandths of an inch per hour was arbitrarily chosen and was employed throughout this investigation. The agitation employed was a modification of the Simon and Lumley[4] principle by increasing the relative movement between the cathode and the solution which was accomplished by rotating the cathode in the moving electrolyte. This was quite practical since the most common shapes plated were either a cylinder or a simple modification of one.

The experimental equipment consisted of a tank constructed so that the solution could be pumped through a rotating cylindrical cathode. After considerable experimentation the most practical rate of agitation was expressed by the number of revolutions the cathode traveled and the number of gallons passing through the cathode per minute. This preliminary work established the following standard conditions which were adopted. A steel shell 3½ inches in diameter was rotated at 125 revolutions per minute around a one inch cast cylindrical silver anode located at the center of the cathode shell. The solution was circulated through the shell at approximately 50 gallons per minute. The cathode current density employed was 100 amperes per square foot. It was under these standard conditions that the above listed six variables were investigated.

The development of a suitable anode for the work proved to be a major problem. The commercially available rolled silver anodes were unsuitable because of their size and shape limitations.

Silver shot was unsatisfactory because of the tendency of small anode particles to become occluded within the deposit. A cast silver anode was developed which was neither cold worked nor annealed. The silver was cast in either carbon on cast iron molds with a mold temperature below 700° F. at the pouring time. It was found that the anode purity for the high pH silver bath was not as critical as reported for the low current density plating conditions employed in a conventional type bath[6]. Allowable contamination in the silver made it possible to deplate scrap material and recast with some sweetening of virgin silver ingots so that the purity was maintained at approximately 99.9%.

The character of the cathode deposit, the anode corrosion and the solution behavior were judged either satisfactory or unsatisfactory by observation of the following items:

a. Electrochemical solution characteristics of the cast anode
b. Impurities in the deposit
c. Porosity of the deposit
d. Ductility of the deposit
e. Structure of the deposit
f. Chemical consumption of the bath
g. Rate of cathode deposition
h. Bath temperature

The five baths tabulated in Table No. 1 were typical of a large number of experimental compositions studied which lead to the development of the present high pH silver bath.

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TABLE No. 1

Typical Baths Studied

Bath No.	Composition		Remarks
1	Silver cyanide	30 g/l	Common bath[7]
	Free potassium cyanide	25 g/l	
	Potassium carbonate	50 g/l	
	CS_2 brightener	.95 cc/l	
	Operating temperature	40° C.	
2	Silver cyanide	60 g/l	
	Free potassium cyanide	55 g/l	
	Potassium carbonate	50 g/l	
	Potassium hydroxide	10 g/l	
	Operating temperature	45° C.	
3	Silver cyanide	42 g/l	
	Free potassium cyanide	40 g/l	
	Potassium carbonate	50 g/l	
	Potassium hydroxide	10 g/l	
	Operating temperature	45° C.	
4	Silver cyanide	42 g/l	
	Free sodium cyanide	30 g/l	
	Sodium hydroxide	10 g/l	
	Sodium carbonate	50 g/l	
	Operating temperature	45° C.	
5	Silver cyanide	107 g/l	duPont[8]
	Free potassium cyanide	54 g/l	(communicated)
	Sodium thiosulfate	0.2 g/l	
	Operating temperature	45° C.	

Discussion

Bath No. 1

The standard bath proved unsatisfactory under rapid plating conditions. The objections to this bath were severe polarization of the anode which resulted in low anode corrosion, high cyanide consumption and a porous silver deposit.

Bath No. 2

This bath showed immediate promise under rapid plating conditions. It was soon found that the potassium hydroxide was a fundamental ingredient to rapid plating and that high metal content was not as important as originally suspected. It was necessary to hold the potassium hydroxide within definite limits of 8 to 14 grams per liter.

A deviation from these limits in either direction resulted in a rough porous deposit. Temperatures below 40° C. caused roughening and porosity in the deposit. Temperatures above 50° C. caused high cyanide consumption. A low free cyanide was found to be beneficial to the formation of a smooth deposit and the lower limit was fixed quite near to excessive anode polarization.

Bath No. 3

Bath No. 3 was developed as a result of a prolonged series of studies on the previous bath in limited production. It was found that the silver content of Bath No. 2 could be appreciably lower with a desirable reduction in dragout losses. The importance of low dragout is readily understood when it is realized that sufficient work is going through the production tanks in an 18 hour period to deposit silver of an amount equal to the total silver content in the bath. Under the conditions of rapid agitation, the carbonate content tends to increase rapidly unless the baths are well covered. For the best plating conditions, the carbonate content should be held between the limits of 45 to 80 grams per liter as potassium carbonate. If the potassium carbonate content was allowed to rise above 95 grams per liter a brittle porous deposit usually resulted.

Bath No. 4

For economical reasons the sodium salts were investigated. Bath No. 4 gave a rough and porous deposit under rapid plating conditions.

Bath No. 5

The addition of sodium thiosulfate to a high concentration silver cyanide bath was investigated at the suggestion of Dr. C. J. Wernlund. The plate produced with this bath was smooth and bright for a relatively short plating time; however, this addition agent decomposed rapidly. Another objection was the severe anode polarization which was probably due to either the sodium thiosulfate or the low pH of the plating bath.

Other Addition Agents

An investigation was conducted to determine the effect of additives on Bath No. 3. The following examples were studied: sodium thiosulfate, carbon disulfide, soaps, excess potassium cyanide, excess potassium carbonate, salts of the metals antimony, arsenic, zinc, magnesium, lead, tin, iron, cobalt, nickel, copper and sodium.

The effects of the sulfur containing addition agents employed in Bath No. 3 were of short life unless the additions were made very frequently because of either the high operating temperature or the high pH of the bath. Carbon disulfide and sodium thiosulfate both gave a coarse columnar micro-structure if the addition agents were added too infrequently; while excessive amounts caused a porous structure. Of all the other additives tried none showed an effect marked enough to warrant its use. Arsenic compounds showed an effect somewhat similar to that of the sulfur containing compounds but their behavior was erratic. Sodium, copper and iron showed either no effect or possibly some tendency to a finer structure. These metals were of special interest since they accumulated in the bath with use of a silver strike containing sodium salts, steel tanks, and cast anodes in which the major impurity is copper.

In Table No. 2 below are listed the quantity of chemicals consumed when plating on the inside of steel cylinders with an anode approximately 40% in area to that of the cathode:

TABLE No. 2

Chemical	*Pounds of chemicals consumed per one hundred pounds of silver deposited.*
Potassium cyanide	4
Potassium hydroxide	9
Silver cyanide	None

The fact that no silver cyanide is added would indicate that the anode efficiency is slightly higher than the cathode efficiency. The efficiencies of both the anode and cathode are approximately 100%. It is possible that the anode efficiency is slightly higher than 100% since silver will go into solution slowly without current in Bath No. 3 with rapid agitation.

Conclusion

Assuming the proper preparation of the steel shells, the rapid silver plating bath which was finally developed as most suitable for use with a cast silver anode and with the particular agitation previously described was Bath No. 3 operated within the following definite limits:

The final values placed on Bath No. 3 were as follows:

Silver cyanide	40-43 grams per liter
Free potassium cyanide...	38-42 grams per liter
Potassium hydroxide	8-14 grams per liter
Potassium carbonate	45-80 grams per liter
Temperature	42°-45° C.

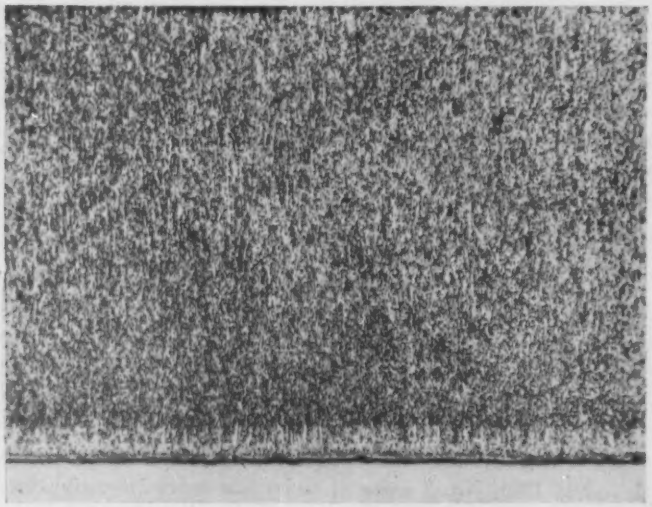

Fig. 1. Section near the center of the cathode shell (white area = steel). X 100

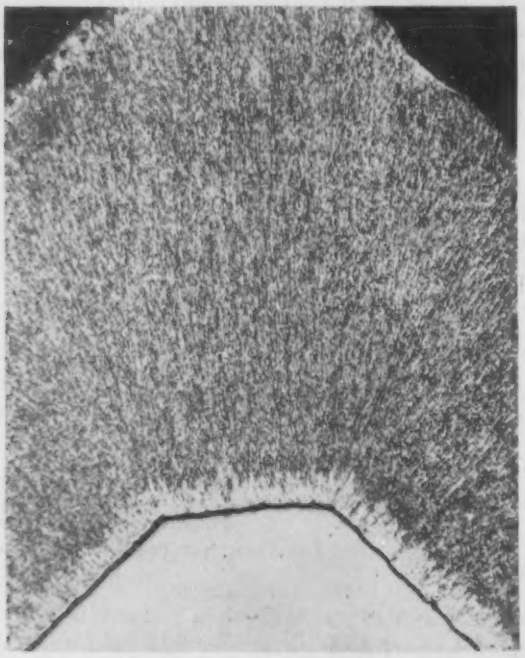

Fig. 2. Section around the flange of the cathode shell. X 100

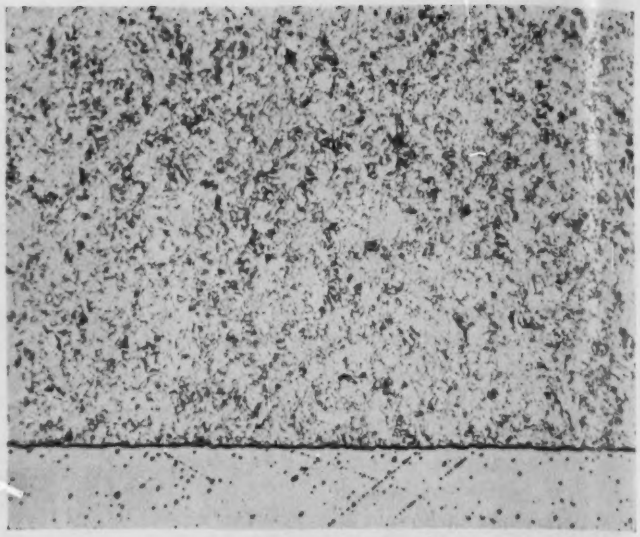

Fig. 3. Section near the center of the cathode shell. Annealed 1 hr. in neutral atmosphere at 900° F. X 100

In Figures 1 and 2 are shown some typical structures obtained from Bath No. 3 operating within the above set limits, while Figure No. 3 is the typical structure obtained by heat treating the silver plate one hour at 950° F. in a reducing atmosphere. The polished specimens were etched for ten seconds with one part of 30% hydrogen peroxide to seven parts of concentrated ammonium hydroxide.

Summary

1. A high pH silver plating bath was developed.
2. The use and advantages of a cast silver anode were pointed out.
3. Low chemical consumption for a rapid silver bath was reported.
4. A rapid silver plating bath which gives a dense and ductile deposit on either the inside or outside of cylinders or simple modifications of cylinders was developed.

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THIS IS WASHINGTON—

By George W. Grupp
METAL FINISHING's Washington Correspondent

Is There a Job Platers' Blacklist Rumors are being circulated that if job platers make applications on form WPB-541 (formerly PD-1), for electroplating and anodizing equipment and their requests are denied the names of such applicants are supposed to be recorded in some sort of blacklist book. As a result, it is reported that job platers who were once denied their requests are reluctant to make other applications for essential equipment. Furthermore, because of these rumors, some job platers are said to hestitate to file their first applications for necessary equipment out of fear of being refused and having their names placed on the blacklist. When an official of the WPB was asked about this rumor he denied the existence of a job platers blacklist; and he also denied that job platers are being discriminated against in any shape or manner. This official said that all applicants whose requests have been denied have a right to appeal to the WPB Appeal Review Board. If sufficient evidence of necessity is presented to the Appeal Review Board the denials are reversed and the applications are approved. Obviously, if this rumor about a WPB job platers blacklist is without foundation of fact, then it is harmful talk. Therefore, if any job platers can produce actual evidence of being unjustly discriminated against, or proof that their names have been placed on a blacklist, the writer of this column would like them to communicate the factual proof to him for he believes that such information should be brought to the attention of Congress and the persons who are placing job platers on a blacklist without good cause should be brought to the bar of justice. On the other hand, if the rumor is untrue, then the perpetrators of such false information should have their mouths sealed.

Army Explains Reasons for Cutbacks to Workers The Army Service Forces is beginning to distribute amongst war workers an illustrated booklet which deals with the handling of production "cutbacks." It explains why cutbacks are necessary to fit into the ever changing needs and requirements of the Army. And it tells how the Army proceeds to make such changes. This booklet is being distributed to inform workers why there is sometimes a falling off in the demand for certain products and an increasing demand for products made in other plants.

Byrnes Discusses Cut-back Procedure In a statement made by Director of War Mobilization James Byrnes, to the Senate Sub-Committee on Military Affairs on June 12, 1944, he stated that, "Each week there is held a meeting of the production committee of the Army Service Forces attended by representatives of the WPB, WMC, and Smaller War Plants Corporation. This meeting indicates tentative general reductions contemplated in any of its programs and lists the contractors involved in such programs." The program is then reviewed by another board. These recommended proposed cutbacks are then "submitted to the Military Cut-back Subcommittee of the Production Executive Committee of WPB. . . . The contractor and his labor representatives are given notice of the cut-back formally, and it is the rule in the Army that at least 30 days' notice in writing shall be given unless exceptional circumstances are presented." Justice Byrnes also said that the "WPB is going to advise contractors in the next few days that, without waiting for X-day, they should now place orders for machine tools as they may require for civilian production."

Capital Additions Cost Procedure Controlled Materials Regulation No. 5, Interpretation No. 11, as amended May 22, 1944, points out that MRO procedure may be used to obtain materials and supplies for minor capital additions not exceeding $500 but all labor costs involved in the manufacture of the materials and equipment must be included in determining the cost of the addition. On the other hand, the cost of labor need not be included in estimating the cost when the labor is used in construction or installation of a minor capital addition.

Contract Termination Problems Discussed W. C. Skuce, Director of the Controlled Materials Plan Division of the WPB, on May 29, 1944, in addressing the National Association of Purchasing Agents said: "Among the problems which you as purchasing agents will face as a result of contract termination are: (1) Segregation of materials and work-in-process resulting from cancellation of war contracts, and for which you will file a claim; (2) questions with respect to the authority that the contractor has to use material resulting from cancellation of war contracts, or your right to sell the material as either new material or scrap; (3) the problem connected with concentration of manufacture resulting from war contract cutbacks; and (4) the problems of war contract cutbacks related to suppliers, particularly where a supplier has turned over the major part of his facilities to the production of specialty components for you as his customer, and where the cutback on the particular program in terms of our regulations might cause him to shut down."

Subcontract Termination Procedure Established The Joint Contract Termination Board adopted unanimously on June 5, 1944, a uniform termination article for use in the settlement of claims under fixed price subcontracts which was approved by Director of War Mobilization James F. Byrnes. This new subcontract article supplements the Uniform Termination Article for prime contractors which was made effective January 8, 1944, by Director Byrnes upon the recommendation of Bernard M. Baruch and John M. Hancock. In Byrnes' statement of policy he said in part that "when settlements of subcontracts are submitted to the contracting officer for approval or ratification, they should be treated like any other element of cost in a prime contractor's settlement proposal, and procedure determining the extent to which they will be scrutinized should recognize the necessity for the accomplishment of speedy and final settlement as well as the protection of the interests of the Government. . . . the procuring agency has, of course, the right, where circumstances indicate the necessity for so doing, to make full investigation of the settlement of

any first tier or more remote subcontract." The formula for both prime and subcontracts is essentially the same. Subcontractors, Justice Byrnes said, are to receive "the full contract price for all completed articles, but get nothing on the portion of the subcontract on which work has not been begun and no costs incurred. On the portion of the subcontract that has been begun but not completed, the subcontractor is entitled to actual costs incurred that are properly allocable to the contract plus an allowance for profit that is not to exceed six per cent of the whole of the costs."

Ideas Wanted to Help Win the War Recently the National Inventors Council of the Department of Commerce made an appeal to Americans that they should submit to them their ideas which possess potential values to successfully prosecute the war. Inventors who submit ideas are assured that their ideas will be kept secret. Here is a chance to do some good work. For example, the armed services certainly could use an idea on how to produce a durable coating suitable for field operation to reduce the glare from glass surfaces.

Plating and Anodizing Equipment May Be Placed Under Order L-123 If some present plans go through the WPB will revoke electroplating and anodizing equipment Order L-110 and incorporate the allocation provisions of that order in General Industrial Equipment Order L-123. No relaxing of restrictions on the allocation of plating and anodizing equipment are contemplated.

Sixteen Point Post-war Program The long awaited report from the Senate Special Committee on Post-war Economic Policy and Planning was submitted to Congress on June 12, 1944. In the second paragraph of this report in reflecting on the post-war employment problem it observes that "the American private economy is going to have to provide the jobs and the committee feels that everything which can help to do this is just as important to labor as it is to business."—and this observation is made in the light that during the first year of peace men will be released from the armed services at the rate of 200,000 per month. As a result the committee presented a sixteen point program which must be considered by Congress to avoid "intolerable unemployment." The sixteen points are: (1) the creation of an over-all demobilization office, (2) the termination of war contracts and clearance of war plants with quick despatch, (3) the disposal of surplus war property in a wise manner, (4) the proper handling of the unemployment compensation problem, (5) the preparing of plans and making available material for construction projects which can be started at once upon cessation of hostilities, (6) the preparation of plans for residential construction, (7) the preparation of a policy and method of handling the labor situation in the 335 war boom counties of the United States, (8) the laying down of a policy on how long price control and rationing should be continued after the war to prevent inflation, (9) the working out of a policy on a post-war budget which will eliminate unnecessary expenditures, (10) the determination of a solution to refinance Treasury obligations, (11) the revision of the tax structure to stimulate production and consumption, (12) the revision of the Securities and Exchange Act to stimulate small business equity financing, (13) the establishment of a policy which will result in an expansion of foreign trade, (14) the clarification of legislation to prevent monopolies and trade barriers, (15) the elimination of unnecessary orders and regulations of bureaus, and (16) the elimination of unnecessary and overlapping of government agencies and bureaus.

Surplus Materials Committee for Small Business Appointed On May 25, 1944, Will L. Clayton, Surplus War Property Administrator, appointed a sub-committee to study ways and means of aiding small business in their desire to get surplus property. One of the principles which was laid down by Administrator Clayton is that surpluses should be offered in lots which will permit small business to participate in the sales of surplus materials.

Technical Advisory Service Available to Platers Members of the metal finishing industry should get in touch with the 14 regional offices of the Smaller War Plants Corporation. The SWPC's Technical Advisory Service is prepared to help small business with their problems of production, merchandising, new materials, and new processes. For example, it has helped small businessmen (1) in reducing the porosity of non-ferrous castings; (2) in providing a satisfactory non-corrosive coating for nails; and (3) in aiding platers to find a rubber substitute for lining electroplating tanks.

Unemployment Benefits Drop According to a report issued by the Social Security Board on June 15, 1944, there was a drop of 32.7 per cent in claims for unemployment benefits during the first quarter of 1944 when compared with the same quarter in 1943. During the first quarter of 1944 there was also a decrease of 51.2 per cent in the number of weeks of unemployment for which compensation was paid.

6,000,000 Additional Women Workers Employed A Special Survey of the Bureau of Census which was issued on June 13, 1944, reveals that the employment of women workers increased from 11,240,000 on March 30, 1940, to 17,470,000 on May 13, 1944. In contrast, on March 30, 1940, there were 33,820,000 men employed as workers as compared with 34,490,000 men workers on May 13, 1944. In other words, while the number of male employees has practically stood still, the number of women workers has increased over 6,000,000.

Abrasive Situation Discussed Members of the Abrasive Industry Advisory Committee on June 2, 1944, expressed the opinion that since most grinding wheels are "tailor made" for special operations, the surplus stocks of abrasive products in the hands of users is not a serious problem of the industry because these special purpose end products are not suited for general purpose abrasives. The committee believes these abrasive products will have to be scrapped with contract changes and terminations.

Brass Castings Under Tighter Regulations The War Production Board announced on June 8, 1944, that all manufacturers wishing to use brass and bronze castings containing more than 74 per cent of copper or 2 per cent of tin, must now apply to the WPB for authorization, unless permission has been granted under a war contract, or especially authorized by WPB, or if the manufacturer has been lawfully using copper base alloy for the same purpose some time during the last six months of 1943. To accomplish the tightening of restrictions Order M-9-c and Order M-43 were revised.

Brass Plating Recommended At a recent meeting of the Hardware Industry Advisory Committee of the WPB recommended that Order L-236 be amended to permit brass plating on hardware because black finish, which is now being used, requires about 40 per cent labor. At this meeting WPB told the Committee that the use of nickel for hardware may be permitted in the near future. They also urged the industry to use aluminum as a substitute for brass.

Chemicals Requiring Reporting The Chemicals Bureau of the WPB announced on May 26, 1944, that producers of anhydrous ammonia, aqua ammonia, and industrial calcium cyanamide, that producers or producers' agents of industrial ammonium sulfate, and producers and distributors of industrial ammonium nitrate, nitric acid, and industrial sodium nitrate are required to file Form WPB-1148 on or before the 10th day of the month previous to allocations. Customers' names of calcium cyanamide are no longer required. Small order exemptions have been set up for industrial ammonium sulfate, nitric acid and ammonium nitrate. These changes were affected by a directive which applied to paragraph (e) of Order M-62, and paragraph (d) of Orders M-163, M-164, and M-165.

Chrome Finish Dental Burr Soon on Market At the recent meeting of the WPB Dental Instrument and Burr Industry Advisory Committee it was revealed that a new type of dental burr has been produced with a chrome finish which has at least 5 per cent longer life than a steel burr. Commercial production of these chrome finish burrs will find their way into the market by July or August of this year.

Copper Recovery Office Moved to Washington The Copper Recovery Inventory Branch of the WPB removed its offices from New York City to Washington, D. C. Anyone wishing to purchase copper and copper base alloy from surplus and idle inventories should communicate with the nearest field office of the War Production Board.

Copper Scrap Price Determination Procedure The provisions of Revised Maximum Price Regulation No. 20 was revised by Amendment No. 2 on May 18, 1944, to enable the OPA to fix the purchase price for copper scrap when a consumer shows that he cannot easily determine it because his specifications are such that the seller cannot afford to prepare the scrap for him under existing price ceilings. In such cases the buyer should apply in writing to the Non-ferrous Metals Branch of the Office of Price Administration, Washington 25, D. C.

Copper-Sulfate Production Increasing in Peru The Quimica Nacional, S. A. of Peru is planning to increase its production of copper sulfate from 60 to 100 metric tons during the year 1944.

More Electric Irons in 1944 The War Production Board announced on June 6, 1944, that an additional 210,400 electric irons for civilians will be produced this year. Proctor Electric Company of Philadelphia was given permission to manufacture 137,800 irons, and Son-Chief Electrics, Incorporated, of Winsted, Conn., was given a quota of 72,600 irons. All of these irons will be of the automatic household models.

Flatware Situation Discussed War Production Board officials told members of the Flatware Manufacturers Industry Advisory Committee on May 27, 1944, that the present restrictions on the use of stainless steel, nickel and copper and copper base are not expected to be relaxed in the near future. The supply of chrome for stainless steel is so limited that further relaxation of restrictions for civilian uses are not likely. The supply of nickel was said to be fairly steady. Restrictions on nickel chemicals will not be relaxed. There will not be additional increases in nickel anodes for the flatware industry. The copper supply has improved enough to permit its use for the production of food dehydration equipment. Members of the committee recommend that more silver should be made available for the production of sterling silverware. The demand for lower-priced flatware has been so urgent that programs are being established for the production of flatware out of materials other than sterling silver. The present flatware program provides for about 30,000,000 pieces per quarter.

Current Demand for Metal Household Items The War Production Board's recent consumer goods survey of miscellaneous household goods indicates that there is a demand for 1,412,000 wash boilers; 3,585,000 tea kettles; 11,632,000 alarm clocks; 1,955,000 step-on kitchen garbage cans; 6,986,000 washtubs; 4,955,000 knives, forks and spoons; 1,638,000 dust pans; 3,886,000 dish pans; 2,381,000 covered kettles; 2,398,000 baking pans; 3,058,000 double boilers; 1,387,000 large outside garbage cans; 4,370,000 can openers; 2,824,000 frying pans; 2,198,000 medium sized sauce pans; 5,774,000 pails or buckets; 393,000 metal bedsteads; 3,727,000 thermos bottles; 8,750,000 straight pins; 7,670,000 metal hairpins; 14,500,000 safety pins; and 17,950,000 bobbie pins.

Preference Order M-43 Amended General Preference Order M-43, as amended June 6, 1944, only has some minor changes which affect primarily the rules governing the use of tin in solder and bronzes. In commenting on this amended order, Mr. Edwin Vogelsang, director of the Tin-Lead Division, said: the "specific tin content solders have been regrouped for specific applications. The purchaser must certify that the solder is to be used solely for a specific purpose and that the tin content of such solder conforms to the restrictions and provisions of General Preference Order M-43."

Silver Order Revised Maximum Price Regulation No. 198 on silver was revised on June 2, 1944, to clarify this regulation which codifies and supersedes existing regulations and orders dealing with silver in the form of bullion, semi-fabricated articles, and scrap. Except for a few minor changes all of the provisions of the previously existing regulations and orders on silver were incorporated in this revised order. In fact, there are only two minor changes from the previous regulations. One change provides that a scale of differentials ranging from 2 cents per ounce for lots less than 2,000 ounces to ¼ cent per ounce for lots of 100,000 up to 200,000 ounces. The second change is that of the elimination of the requirement that all sellers of newly mined domestic silver in semi-fabricated form must make monthly reports.

Sodium Cyanide Requires Conservative Usage The WPB warned the plating industry on June 8, 1944, to be conservative in its use of sodium cyanide because of the critical shortage of this commodity. Sodium cyanide is allocated under Order M-366.

Surplus Inventory Allowance Made Interpretation No. 3 to Controlled Materials Plan Regulation No. 2 was issued June 14, 1944, for the purpose of explaining that persons whose war contracts have been reduced or cancelled will not be violating the inventory provisions of the regulation if their minimum working inventory is in excess of a 60-day supply because of the cutback.

Tinplate Allocation for Third Quarter At the May 22, 1944, meeting of the Can Manufacturing Industry Advisory Committee of the WPB it was revealed that because of the great demand for sheet metal by the armed forces the WPB has been able to only allocate the industry 634,000 tons of tinplate instead of the requested 800,000 tons for the third quarter of 1944.

Zinc May Be Used for Research Purposes Minor changes were made in Conservation Order M-11-b on June 2, 1944. The amended order provides that it is no longer necessary to make individual appeals for the use of zinc for research, development and experimental purposes. And permission was granted to use zinc in the manufacture of certain articles.

Contract Training Course Started The Joint Contract Termination Board announced on June 19, 1944, the opening of a contract settlement training program for war contractors and Government representatives at the University of Pennsylvania. "The purpose of this training program," John M. Hancock, Chairman of the Board, said: "is to speed the settlement of terminated war contracts and in that way contribute to swift reconversion by giving key representatives of the Government and industry intensive advance training in dealing with the problems of contract settlement." The University of Pennsylvania project, it was learned, is to serve as an example for a nation-wide training program which will include about 50 colleges and universities located in various parts of the United States. It is estimated that more than 90,000 war contractors and about 10,000 Government representatives are expected to take advantage of this special training.

Patents

Phosphate Coatings

U. S. Pat. 2,346,302. N. E. Hays and G. R. Hoover and A. E. Taylor, assignors to The American Rolling Mill Co., April 11, 1944. A coating bath containing phosphoric acid for producing controlled light weight phosphate coatings on zinc surfaces in which nitrate is present within the range 0.65 to 1.10% and in which the free acid does not exceed 4.0 points and the total acid does not exceed 25 0 points.

Example:

Nitrate	0.93%
Free acid	2.4 points
Total acid	22.1 "
Zinc	0.45%
Ferrous iron	0.15%

Time—40-60 seconds.
Temp.—135° F.

This solution is claimed to apply a coating thin enough to be suitable for spot welding.

Corrosion Prevention of Aluminum

U. S. Pat. 2,346,658. J. B. Brennan and L. Marsh, said Marsh assignor to said Brennan, April 18, 1944. The method of forming corrosion resistant coatings on aluminum which includes the steps of subjecting the aluminum to electrolysis as an anode in an aqueous solution of a potential condensation product of urea and formaldehyde having boric acid and ammonium hydroxide added thereto and carrying out the electrolysis at a voltage such that sparking takes place on the surface of the aluminum.

Example:

Urea	200 parts
Formaldehyde (40% by volume)	165 "
Boric acid	200 "
Ammonia	112 "

Voltage—250-500.
C.D.—2.6 ma./sq. cm.

Electrolytic Polishing of Copper

U. S. Pat. 2,347,039. C. L. Faust, assignor to Battelle Memorial Institute, April 18, 1944. The method of anodically polishing copper, which comprises making the copper the anode in a solution comprising essentially from 0.1 to 85% of phosphoric acid, from 0.1 to 65% of CrO_3, and from 13 to 90% of water, all of said percentages being by weight of said solution and the relative percentages of said three solution ingredients lying within the area defined in the accompanying diagram by the line AB, the straight line BC, the straight line CD, and the straight line DA, and passing an electric current therethrough of sufficient density and for a sufficient period of time to effect the polishing of said copper.

Example:

Phosphoric acid	60%
Chromic acid	10%
Water	30%

Temp.—60-170° F.
Time—1½-12 min.
C.D.—100-1,000 amp./sq. ft.

Electrolytic Polishing of Steel

U. S. Pat. 2,347,040. C. L. Faust, assignor to Battelle Memorial Institute, April 18, 1944. The method of anodically polishing plain carbon and low alloy steels and ingot iron which comprises making the steel or iron the anode in a solution comprising essentially from 45% to 85% of phosphoric acid, from 0.1 to 29% of CrO_3, and from 14 to 37% of water, all of said percentages being by weight of said solution and the relative percentages of said three solution ingredients lying within the area defined on the accompanying diagram by the straight line AB, the line BC and the line CA, and passing an electric current therethrough of sufficient density and for a sufficient period of time to effect a polishing of said steel or iron.

Example:

Phosphoric acid	70%
Chromic acid	10%
Water	20%

Temp.—100-155° F.
Time—30 min.
C.D.—100-500 amp./sq. ft.

Bright Copper Bath

U. S. Pat. 2,347,448. C. J. Wernlund, assignor to E. I. duPont de Nemours & Co., April 25, 1944. A process for the electrodeposition of bright copper which comprises electrolyzing a solution containing 8 to 22 oz. per gallon of copper cyanide, 3 to 8 oz. per gallon of alkali metal hydroxide, 0.25 to 8 oz. per gallon of alkali metal sulfocyanide and an amount of alkali metal cyanide equivalent to a sodium cyanide to copper cyanide weight ratio of from 1:1 to 1.25:1, the alkali metal constituents of said solution being sodium and potassium present in the proportion of 1 to 6 moles of sodium ions for each mole of potassium ions.

Example:

Copper cyanide	16 oz./gal.
Sodium cyanide	18 "
Potassium hydroxide	6 "
Sodium thiocyanate	¼-8 "

Temp.—75-85° C.
C.D.—30-75 amp./sq. ft.

The molar ratio of sodium to potassium ions should be 1:1 to 6:1. Various addition agents such as carbohydrates (starch, gum arabic, sugars, etc.), and high molecular betaines can be used.

Fused Copper Bath

U. S. Pat. 2,347,450. J. H. Young, assignor to E. I. duPont de Nemours & Co., April 25, 1944. The process for electrodeposition of copper which comprises electrolyzing a molten bath which consists essentially of alkali metal cyanide and about 1 to 50% by weight of copper cyanide, at a temperature not greater than about 600° C.

Example:

Copper cyanide	1- 5% by wt.
Sodium cyanide	95-99% "

Temp.—Below 600° C.
C.D.—7-35 amp./sq. ft.

Higher copper contents result in spongy deposits.

Electrolytic Polishing of Stainless Steel

U. S. Pat. 2,348,517. G. J. Beckwith, assignor to The American Steel and Wire Co., May 9, 1944. A method of anodically polishing stainless steel, characterized by immersing said steel in an electrolyte by volume consisting of one part of a solution of 7 pounds of glycine to a gallon of water, five parts 85% ortho-phosphoric acid and four parts 96% sulphuric acid, and making said steel the anode in an electrolytic circuit including said electrolyte with the electrolyte current at a sufficient density per unit area of said steel to effect polishing.

Example:

C.D.—3-4 amp./sq. in
Voltage—9 volts.
Temp.—160° F.
Time—2-3 min.

Anodizing Magnesium

U. S. Pat. 2,348,826. E. Krause and E. Schroder (Germany), vested in the Alien Property Custodian, May 16, 1944. A process for the production of protective layers of oxide on objects made of magnesium or magnesium alloys comprising making said objects the anode in a bath containing an alkali arsenate, zincate or aluminate, and passing an electric current through said bath.

Example:

1. Water 1 liter
   Sodium aluminate 200 g.
   Cerium sulfate 3 "

pH—10-13.
Temp.—40° C.
C.D.—1-3 amp./sq. dm.

2. Water 1 liter
   Sodium arsenate 200 g.
   Cerium sulfate 3 "

pH—10-13.
Temp.—50° C.
C.D.—1-3 amp./sq. dm.

Sandblasting

U. S. Pat. 2,348,505. J. N. Voerge (Canada), May 9, 1944. An abrasive blasting apparatus, comprising, an elongated support adapted to extend lengthwise of a vessel at a central location, means for supporting the shaft at a plurality of points within the vessel, a carriage mounted on said support for axial and radial movement in relation thereto, abrasive blasting instrumentalities mounted on said carriage, and control means connected to said carriage remotely from said instrumentalities.

Corrosion Inhibitor

U. S. Pat. 2,349,044. E. J. Jahn, assignor to Shell Development Co., May 16, 1944. A corrosion-inhibiting composition comprising non-gaseous hydrocarbons containing amounts sufficient to inhibit corrosion each of a polycarboxylic acid having corrosion-inhibiting properties, and of an auxiliary oil-soluble, water-insoluble compound having but little corrision inhibiting power selected from the group consisting of hydrocarbon monocarboxylic acids free from ether-forming hydroxyl radicals and esters thereof with monohydric alcohols.

Dictionary of Metal Finishing Chemicals

Triethanolamine: $(CH_2OHCH_2)_3N$. Mol. wt. 149.194. Sp. gr. 1.124. M. P. 21.2°C. B. P. 277°-279°C. (150 mm.). Also known as 2, 2', 2"-Nitrilotriethanol, Triethylolamine, B, B', B"-trihydroxytriethylamine. Viscous, colorless to pale yellow liquid. Slightly ammoniacal odor. Infinitely soluble in water and in alchol. Slightly soluble in ether. Grades: Technical. Containers: Bottles (1, 5 lb.); Tins (1, 5 gal.); Drums (5, 10, 55, 110 gal.).

Trihydroxybenzene: See Pyrogallic Acid.

Trihydroxybenzoic Acid-3, 4, 5: See Gallic Acid.

Trinitrophenol-2, 4, 6. See Picric Acid.

Trioxybenzoic Acid: See Gallic Acid.

Tripoli: Also known as Rottenstone. An abrasive containing a high percentage of silica. Formed naturally by decomposition of sandstone. Porous pink rock or pink powder. Grades: Technical. Containers: Tins (1, 5, 25 lb.); Drums (100 lb.); Kegs (100, 125 lb.); Bags (150, 200, 250 lb.); Barrels (500 lb.).

Tristearin: See Stearin.

Tungsten: W. At. wt. 183.92. Sp. gr. 19.3. M. P. 3375°C. Cubic gray black metal, powder, rods, wire. Very hard and brittle. Insoluble in water. Soluble in hot concentrated sodium and potassium hydroxides. Slightly soluble in nitric acid and in aqua regia. Grades: Technical, C. P. Containers: Bottles and Cartons (1 oz., ¼, 1, 5 lb.); Kegs; Drums.

Tungsten Hexa-Fluoride: WF_6. Mol. wt. 297.92. M. P. 2.5°C. B. P. 19.5°C. Light yellow liquid. Sp. gr. 3.44 or colorless gas. Sp. gr. 9.98 (air=1). Decomposes in water. Soluble in alkalies.

Tungsten Trioxide: WO_3. Mol. wt. 321.92. Sp. gr. 7.16. M. P. 1473°C. Also known as Tungstic Acid anhyride. Rhombic yellow crystals or yellow powder. Insoluble in water. Soluble in hot alkalies and in hydrofluoric acid. Insoluble in acids. Grades: Technical, Purified, C. P. Containers: Bottles (1, 5 lb.); Kegs; Barrels.

Tungstic Acid: H_2WO_4. Mol. wt. 249.94. Sp. gr. 5.5. Yellow powder. Loses one molecule of water when heated. Insoluble in cold water. Slightly soluble in hot water. Soluble in alkalies and in hydrofluoric acid. Grades: Technical, Purified, C. P. Containers: Bottles (1, 5 lb.).

These pages comprise the final installment of the dictionary of chemicals used in the finishing industry.

Turkey Red Oil: Sulfonated castor oil. Grades: Technical. Containers: Bottles (1 lb.); Cans (1, 5 gal.); Kegs (100 lb.); Barrels (400, 500, 750 lb.).

Turpentine: See Turpentine Oil.

Turpentine Oil: Sp. gr. 0.862-0.889. B. P. 154-159°C. Also known as Gum Spirits. A colorless mobile liquid with odor of rosin. Insoluble in water. Grades: Crude, Pure, Venice, Venice Artificial, U. S. P., C. P. Containers: Bottles (1, 5 lb.); Tins (1, 5 gal.); Drums (50, 55 gal.); Barrels.

Turps: See Turpentine Oil.

Umber: Brown mineral containing ferric oxide together with silica, alumina, manganese and calcium oxide. Usually in form of brown powder. Grades: Technical, based on iron content. Containers: Cartons (1, 5 lb.); Barrels.

Uranium: U. At. wt. 238.07. Sp. gr. 18.7. M. P. 1800°C. Cubic silvery white metal, fused lumps or powder. Insoluble in water. Soluble in acids. Insoluble in alkalies and in alcohol. Grades: Technical, C. P. Containers: Bottles (1, 10 g.); Boxes.

Uranium Acetate: $(CH_3COO)_2UO_2{\cdot}2H_2O$. Mol. wt. 424.19. Sp. gr. 2.89. Also known as Uranyl Acetate. Rhombic yellow crystals or yellow crystalline powder. Loses water of crystallization at 110°C. Decomposes when heated to 275°C. Solubility, 7.7 at 15°C. Decomposes in hot water. Soluble in alcohol. Grades: Technical, C. P. Containers: Bottles (1 oz., ¼, 1 lb.); Kegs (100 lb.); Barrels (200 lb.).

Uranium Nitrate: $UO_2(NO_3)_2{\cdot}6H_2O$. Mol. wt. 502.18. Sp. gr. 2.81. M. P. 59°C. B. P. 118°C. Also known as Uranyl Nitrate. Rhombic yellow deliquescent crystals. Solubility, 170 at 0°C. and 630 at 72°C. Very soluble in alcohol. Grades: Technical, U. S. P., C. P. Containers: Bottles (1, 5 lb.); Boxes (55 lb.); Jars (5, 56 lb.).

Uranyl Acetate: See Uranium Acetate.

Uranyl Nitrate: See Uranium Nitrate.

Urea: $CO(NH_2)_2$. Mol. wt. 60.058. Sp. gr. 1.335. M. P. 133°C. Also known as Carbamide. Tetragonal colorless or white crystals or white granules. Solubility, 78 at 5°C. and 119 at 25°C. Soluble in alcohol and in conc. hydrochloric acid. Grades: Technical, Purified, C. P. Containers: Bottles (1, 5 lb.); Boxes (25, 100 lb.); Kegs (100 lb.); Cases (110, 220 lb.); Barrels (200 lb.).

Vanadium: V. At. wt. 50.95. Sp. gr. 5.9. M. P. 1720°C. Cubic light gray metal, fused lumps or powder. Insoluble in water. Soluble in nitric acid, in sulfuric acid, in hydrofluoric acid and in aqua regia. Insoluble in hydrochloric acid and in alkalies. Grades: Technical. Containers: Bottles (1, 10 g.).

Vaseline: See Petrolatum.

Verdigris: See Copper Acetate, Basic.

Verdigris, Blue: See Copper Acetate, Basic.

Verdigris, Green: See Copper Acetate, Basic.

Vermilion: See Mercuric Sulfide, Red.

Vienna Lime: See Lime, Vienna.

Vinegar Acid: See Acetic Acid.

Vinegar: Impure form of dilute acetic acid. Usually contains 4%-6% acetic acid, q.v. but may go as high as 12% (wine vinegar).

Vitreosil: Fused silica-acid resistant (except hydrofluoric).

Vitriol, Blue: See Copper Sulfate.

Vitriol, Green: See Ferrous Sulfate.

Vitriol, Oil of: See Sulfuric Acid.

Vitriol, White: See Zinc Sulfate.

Washing Soda: See Sodium Carbonate, Decahydrate.

Water Glass: See Sodium Silicate.

Water, Lime: See Limewater.

Water, Ammonia: See Ammonium Hydroxide.

White Acid: Mixture of ammonium bifluoride and hydrofluoric acid.

White Antimony: See Antimony Oxide-Tri.

Abbreviations: Mol. wt. = Molecular Weight; Sp. gr. = Specific Gravity; M. P. = Melting Point; B. P. = Boiling Point; Solubility figures, where given, are parts by weight in 100 parts of water; Technical = Grade usually used for industrial purposes; Purified or Pure = Better grade than Technical; U. S. P. = Conforms to standards of U. S. Pharmacopoeia; C. P. = Chemically pure, exceeding requirements of the U. S. P.; N. F. = Meets requirements of the National Formulary.

White Arsenic: See Arsenic Oxide-Tri.

White Lead: See Lead Carbonate, Basic.

White Mineral Oil: See Petrolatum, Liquid.

White Tar: See Naphthalene.

White Vaseline: See Petrolatum.

White Vitriol: See Zinc Sulfate.

White Zinc: See Zinc Oxide.

Whiting: Also known as Paris White. A crude, ground and purified chalk or calcium carbonate, q.v. Grades: Technical. Containers: Tins, Bags, Cartons (1, 5, 10, 25 lb.); Bags (100 lb.); Barrels (400 lb.).

Wine Lees: See Argols.

Wood Alcohol: See Methyl Alcohol.

Wood Spirit: See Methyl Alchol.

Wood Naphtha: See Methyl Alcohol.

Wool Grease: See Degras.

Xylene: $C_6H_4(CH_3)_2$. Mol. wt. 106.136. Sp. gr. 0.861-0.875. B. P. 137°-140°C. Also known as Dimethylbenzene, Xylol. Clear, colorless inflammable liquid. Commercially a mixture of ortho, meta and para-xylene. Insoluble in water. Very soluble in alcohol and in ether. Grades: Technical, Purified, C. P. Containers: Bottles (1, 5 lb.); Cans (25 lb., 5 gal.); Drums (5, 55, 110 gal.); Tank Cars.

Xylol: See Xylene.

Yellow Prussiate of Potash: See Potassium Ferrocyanide.

Yellow Prussiate of Potassium: See Potassium Ferrocyanide.

Yellow Prussiate of Soda: See Sodium Ferrocyanide.

Yellow Prussiate of Sodium: See Sodium Ferrocyanide.

Zinc: Zn. At. wt. 65.38. Sp. gr. 7.14. M. P. 419.4°C. Also known as Blue Powder. Hexagonal bluish white metal or gray powder. Insoluble in water. Soluble in acids and in alkalies. Grades: Technical, Pure, C. P.-Granular (10, 20, 30, 40 and 80 mesh), Mossy, Shot, Stick, Dust, Foil, Sheet, Balls, Slabs, Turnings, Powder. Containers: Bottles, Can, Canisters, Cartons (1, 5 lb.); Bags and Cans (25 lb.); Tins (50, 100 lb.); Drums (100, 200, 500 lb.).

Zinc Ammonia Chloride: See Zinc Ammonium Chloride.

Zinc Ammonium Chloride: $ZnCl_2 \cdot 5NH_3 \cdot H_2O$. Mol. wt. 239.47. Also known as Zinc Ammonia Chloride. White deliquescent powder. Odor of ammonia. Soluble in water with decomposition. Soluble in acids and in ammonium hydroxide. Grades: Technical. Containers: Bottles (1, 5 lb.); Cartons (5, 25 lb.) Kegs (100 lb.); Barrels (500 lb.).

Zinc Carbonate: $ZnCO_3$. Mol. wt. 125.39. Sp. gr. 4.44. Trigonal colorless crystals or white powder. Loses carbon dioxide when heated above 300°C. Insoluble in water. Soluble in alkalies, in ammonium salt solution, in cyanides. Grades: Technical, U. S. P., C. P. Containers: Bottles and Cartons (1, 5 lb.); Cartons (10 lb.); Boxes (25, 50 lb.); Drums (25, 100 lb.); Kegs (100, 125, 150 lb.); Barrels (250, 300 lb.).

Zinc Chloride: $ZnCl_2$. Mol. wt. 136.29. Sp. gr. 2.91. M. P. 262°C. B. P. 732°C. Deliquescent cubic white crystals or granules, also fused sticks. Solubility, 432 at 25°C. and 615 at 100°C. Very soluble in alcohol and in ether. Grades: Technical,—fused, granulated, crystal, solution, U. S. P., C. P. Containers: Bottles (1, 5 lb.); Jars (25 lb.); Cans (5, 25, 50, 60 lb.); Drums (100, 475, 492, 500, 580, 600, 650, 900 lb.); Kegs (140 lb.); Barrels (500, 600 lb.); Solution in Tank Cars.

Zinc Chromate: $ZnCrO_4 \cdot 7H_2O$. Mol. wt. 307.50. Also known as Zinc Yellow. Yellow crystalline powder. Insoluble in water. Soluble in acids. Grades: Technical, C. P. Containers: Bottles (1, 5 lb.); Cartons (5, 25 lb.); Kegs and Drums (100 lb.); Barrels (350 lb.).

Zinc Cyanide: $Zn(CN)_2$. Mol. wt. 117.42. Rhombic colorless crystals or fine white powder. Decomposes when heated to 800°C. Insoluble in water. Soluble in alkalies and in cyanide solutions. Insoluble in alcohol. Grades: Technical, Purified. Containers: Bottles (1, 5 lb.); Tins (1, 5, 10, 25, 50 lb.); Drums and Kegs (100 lb.).

Zinc Ferrocyanide: $Zn_2Fe(CN)_6 \cdot 3H_2O$. Mol. wt. 396.68. White powder. Decomposes when heated. Insoluble in water. Soluble in ammonium hydroxide. Insoluble in hydrochloric acid. Decomposes in alkalies. Grades: Technical, Purified. Containers: Bottles (1 oz., ¼, 1 lb.).

Zinc, Flowers of: See Zinc Oxide.

Zinc Orthophosphate: See Zinc Phosphate.

Zinc Oxide: ZnO. Mol. wt. 81.38. Sp. gr. 5.61. M. P. above 1800°C. Also known as Zinc White, Flowers of Zinc. Fine white powder. Insoluble in water. Soluble in acids, in alkalies, in cyanide solutions, solutions of ammonium chloride, and in ammonium hydroxide. Grades: Technical, U. S. P., C. P. Containers: Bottles (1, 5 lb.); Cartons (1, 2, 5, 10, 25 lb.); Kegs (25, 100 lb.); Barrels (150, 220, 250, 300 lb.).

Zinc Phosphate: $Zn_3(PO_4)_2 \cdot 4H_2O$. Mol. wt. 458.16. Sp. gr. 3.04. Also known as Zinc Orthophosphate, Tribasic Zinc Phosphate. Rhombic colorless crystals or white powder. Insoluble in water. Very soluble in acids, in ammonium hydroxide and in solutions of ammonium salts. Grades: Technical, Purified, C. P. Containers: Cartons and Bottles (1, 5 lb.); Boxes; Kegs.

Zinc Phosphate, Tribasic: See Zinc Phosphate.

Zinc Sulfate: $ZnSO_4 \cdot 7H_2O$. Mol. wt. 287.55. Sp. gr. 1.97. Also known as White Vitriol, White Copperas, Rhombic colorless efflorescent crystals or white flakes and granules. Loses water of crystallization when heated to 280°C. Solubility, 115 at 0°C. and 664 at 100°C. Slightly soluble in alcohol. Grades: Technical, U. S. P., C. P. Containers: Bottles and Cartons (1, 5 lb.); Kegs (25, 100, 125 lb.); Barrels (50, 350, 400 lb.).

Zinc Sulfate, Anhydrous: $ZnSO_4$. Mol. wt. 161.44. Sp. gr. 3.74. Also known as Dried Zinc Sulfate. White powder. Decomposes when heated to 740°C. Solubility, 86.5 at 80°C. and 80.8 at 100°C. Grades: Technical, Purified, C. P. Containers: Cartons and Bottles (1, 5 lb.); Cartons (25 lb.); Kegs (100 lb.); Barrels (350, 450 lb.).

Zinc Sulfate, Dried: See Zinc Sulfate, Anhydrous.

Zinc Sulfide: $ZnS \cdot H_2O$. Mol. wt. 115.46. Sp. gr. 3.98. M. P. 1049°C. Yellowish white powder. Insoluble in water. Soluble in acids. Grades: Technical, Purified, C. P. Containers: Bottles (1, 5 lb.); Cartons (25 lb.); Bags; Barrels.

Zinc White: See Zinc Oxide.

Zinc Yellow: See Zinc Chromate.

Zirconium: Zr. At. wt. 91.22. Sp. gr. 6.4 M. P. 1900°C. Cubic silvery white or grayish, inflammable, hard crystalline scales or powder. Insoluble in water. Slightly soluble in acids. Soluble in aqua regia and in hydrofluoric acid. Grades: Technical. Containers: Bottles (1 oz., ¼, 1, 5 lb.); Kegs (25 lb.).

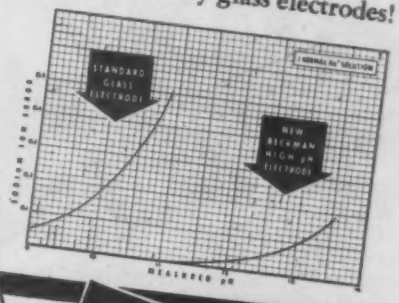
Abbreviations: Mol. wt. = Molecular Weight; Sp. gr. = Specific Gravity; M. P. = Melting Point; B. P. = Boiling Point; Solubility figures, where given, are parts by weight in 100 parts of water; Technical = Grade usually used for industrial purposes; Purified or Pure = Better grade than Technical; U. S. P. = Conforms to standards of U. S. Pharmacopoeia; C. P. = Chemically pure, exceeding requirements of the U. S. P.; N. F. = Meets requirements of the National Formulary.

Check your knowledge of pH

Do you know the answers to these important pH questions?

Q. *There is only ONE make of modern pH equipment with which accurate pH measurements can be made in highly alkaline solutions, even in the presence of sodium ions. Do you know what that make is?*

A. Beckman pH equipment—and *only* Beckman equipment! Note in chart the accuracy of Beckman Type E Glass Electrode in highly alkaline solutions compared with ordinary glass electrodes!



Q. *There is only ONE make of pH equipment with which glass electrode pH measurements can be made in boiling hot process solutions. Do you know the name of this equipment?*

A. Again Beckman—and *only* Beckman! With Beckman High Temperature Glass Electrodes, continuous pH measurements can be made in solutions as hot as 100°C (212°F). This feature is highly important to consider in the purchase of pH equipment for *any* purpose. Even though your present operations may not involve hot solutions, you never know when changes or additions to your operations may obsolete equipment not providing this feature. Buy Beckman to begin with *and be sure!*

There's a Beckman pH instrument for your requirement.

Beckman Automatic pH Indicator
The most advanced pH instrument available for large-scale pH control. Indicates pH completely automatically. Also operates pH recording and control equipment!

Beckman Industrial pH Meter
Combines high accuracy with knockabout ruggedness for portable plant and field use. Gives instant pH readings at the touch of a button. Also *continuous* indication!

Beckman Laboratory pH Meter
Combines high precision with wide versatility to meet every laboratory and research need.

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INSTRUMENTS CONTROL MODERN INDUSTRIES

SHOP PROBLEMS

PLATING AND FINISHING
POLISHING — BUFFING
CLEANING — PICKLING
HOT DIP FINISHES

METAL FINISHING publishes, each month, a portion of the inquiries answered as a service to subscribers. If any reader disagrees with the answers or knows of better or more information on the problem discussed, the information will be gratefully received and the sender's name will be kept confidential, if desired.

Shop Problem

We have received an inquiry for information relative to processes known as "Brightmanizing" and the "Permyron Process." If any of our readers are familiar with these processes, we would be pleased to hear from them.

Electrodeposition of Zirconium

Question: I am interested in the possibilities of palladium deposits and would appreciate it if you could send me the name of those companies that could supply me either with the solution or the salts required.

Also I would like to know if you are familiar with any attempts that have been made to electroplate zirconium.

N. L.

Answer: Palladium solutions and salts may be obtained from Precimet Laboratories, 64 Fulton Street, New York, N. Y., and Baker & Co., Inc., 113 Astor Street, Newark, N. J.

The only reference we have on the electrodeposition of zirconium is the paper by Bradt and Linford, Transactions, Electrochemical Society, Vol. 70 (1936). The details of the solution and its operation are as follows: 18 grams of zirconium oxide are dissolved in sulfuric acid and evaporated to dryness. The salt is dissolved in 100 cc. of 0.5 molar sodium sulfate and diluted to 500 cc. Platinum anodes are used. Current density is 0.12 amp./sq.. cm.; voltage is 5.8-6.4; temperature is 32°C. and pH is 1.20. Moderate agitation is desirable.

Copper Cyanide

Question: Recently we purchased some copper cyanide and cannot seem to get good results from it. We have a 55 gallon strike tank and make the solution up as follows:

4 oz. per gallon of Copper Cyanide
4 oz. per gallon of Sodium Cyanide

We have checked our electrical contacts and found them O. K. We seem to have excessive gassing at the cathode which is as it should be due to the fact that we are using a 12 volt strike, but the copper does not color fast and gives very slow deposition. We are under the impression that the compound contains much carbonate and would like to have it checked.

We are aware of the fact the above solution should have 2 oz. of sodium carbonate per gallon added, but we do not believe it necessary in our case.

In the past we have made up solutions of this formula and it has worked as would be expected. In this case our anodes seem dark and we cannot believe it is due to lack of "free" cyanide.

We are sending you a sample of our solution and also the compound.

R. & M., INC.

Answer: Analysis of this solution shows a copper content of 2.6 oz. per gallon and a free cyanide content of 1.0 oz. per gallon. You did not state at what temperature this solution is operated, but we would advise that although this analysis is suitable for operation at temperatures above 120°F., the cyanide content is too high for room temperature operation with any efficiency. If you are operating at room temperature, we would suggest that you cut the cyanide content down to not more than ½ oz. per gallon by adding copper cyanide.

Weight of Gold Used

Question: I am a subscriber to your magazine and would like to ask the following question. I have a problem which I would like to have you help me solve:

I am plating with gold and wish to know how many pennyweights I am using.

With each rack I use 10 amperes for 30 seconds, or 300 ampere seconds—if correct how many ampere seconds do I use to plate out one pennyweight of gold.

Kindly give me simple figures.

H. S.

Answer: We are glad to furnish you with the following figures:

1 ampere minute = 0.1226 grams
= 0.0788 dwt.
10 amp. for 30 seconds =
5 amp. min. = 0.394 dwt. gold.
This is at 100% efficiency.

Plating Time

Question: I am most desirous of any information you may give me on nickel plating .0004" on brass base and gold plating .0004" on the nickel plate. I have been an old subscriber and recently went back to plating again. The finish on the above is to be semi-bright (scratch brushed). There has been trouble in obtaining a deposit heavy enough, especially on the gold.

H. H. P.

Answer: At 3.1 amp./sq. ft. it will take about 50 minutes to deposit 0.0004" of gold. This current density is about the maximum which can be obtained without resulting in a rough deposit except under closely controlled conditions. The same thickness of nickel can be applied in the same time at 10 amp./sq. ft. which is also about the highest current density obtainable in a cold nickel solution.

Cleaning Brass Stampings

Question: In the cleaning of sheet brass stampings, we are using a neutral soap and hot water in our burnishing barrels. After the burnishing process, we wash these parts in boiling water preparatory to plating, however we are having difficulty getting these parts thoroughly clean as an oily surface still remains on these parts which interferes with the proper plating. Could you inform us what to use to remove this oily surface or oily soap film.

P. J. C.

Answer: The burnishing barrel is not used for the removal of oil and the work should be absolutely clean before entering the barrel since any oil remaining on the work will form a film on the burnishing balls and prevent proper burnishing.

We would suggest that you clean the brass in a good alkaline cleaner to remove the oil and rinse thoroughly before burnishing.

Removing Oily Coating

Question: We would like to know the best method and solvent for removing the oily coating on formed steel sheets we handle in our shop.

Rather than going to the expense of installing tanks, using the vapor-phase method —what other efficient procedure could we use?

These sheets are made into spherical floats, 5' in diameter, weighing nearly 700 pounds.

The degreasing is necessary to permit a paint coat of zinc chromate primer.

Your comments and suggestions will be valued.

W. H. B.

Answer: A very satisfactory method of removing the oily coating is to soak the parts in a solvent emulsion.

There are a large number of these emulsions on the market, and you can obtain the material from any local cleaning or detergent manufacturer.

We are enclosing a tear sheet of our 1944 *Metal Finishing Buyers' Directory* which lists manufacturers of such materials.

FERRODEX

Kemtex
CLEANING COMPOUND

Just as the general staff moves to new advanced positions as the progress of battle dictates . . . the bulk of discriminating metal cleaner users also are quick to take advantage of new and important developments.

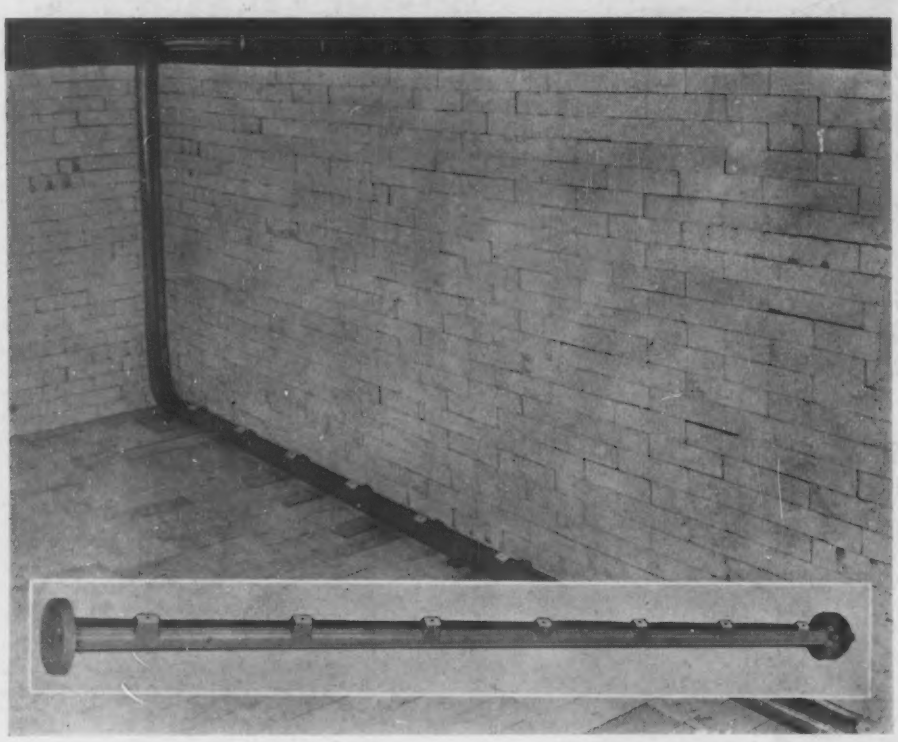
This year the trend and movement is definitely toward MacDermid Chemical Co., Bristol, Conn. The FERRODEX and KEMTEX Compounds offer such a tremendous improvement over present accepted formulation and procedure that these materials have already been selected as outstanding contributions to the metal finishing industry.

Intelligent Sales and Service

W. D. MAC DERMID Chemical Company
BRISTOL, CONNECTICUT

NEW EQUIPMENT AND SUPPLIES

NEW PROCESSES, MATERIALS AND EQUIPMENT FOR THE METAL INDUSTRY



Jet Agitator

The Heil Engineering Company, Dept. MF, 12901 Elmwood Avenue, Cleveland, has developed a new type of steam jet for tank processing of bar metals, wire, and continuous sheet or strip, furnished in flanged sections which can be coupled together to provide any desired length, and to extend the agitating and heating effect to any part of a tank.

Designed to speed pickling or processing and to provide more complete agitation and more uniform heating, this jet can be adapted to square, rectangular or round tanks. Boiling temperatures can be attained, at which these rugged jets will give unusually long service. Sections are usually made in lengths of about 10 feet, and are coupled with lead bolts, with a blind flange to close the open end. Nozzles are spaced along the tank bottom on 15″ centers unless otherwise specified by the user.

The series of nozzles along the entire length of the tank creates a rolling, agitating effect similar to a barrel roll, causing the liquid to circulate above and around the parts immersed. The effect is increased by placing jets on either side or all around the bottom of the tank, with nozzles set at angles to produce the maximum rolling effect. The nozzle used is a patented device with an orifice of graphitic carbon, which is unaffected by the corrosive attack of most chemical solutions.

Several modifications of this same style jet are available. These have been developed for batch processing.

The jets are furnished with a steam flange and bolts to connect to a standard 6″ O.D. flange reduced for 1″ steam supply line. The recommended steam pressure is 80 pounds, although a maximum pressure of 125 pounds may be used. It is possible to use air steadily or intermittently along with steam to produce greater agitation, and in some cases this has been found desirable.

This company has just issued a bulletin, available on request, describing various steam jets.

Heat Exchanger

The *National Carbon Company, Inc.*, Dept. MF, has developed a compact and sturdy new type of corrosion resistant "Karbate" heat exchanger to meet the need for a chemically inert, mechanically strong heating (or cooling) unit for use in pickling tanks and other metallurgical applications. The "Karbate" material from which the heater is made is an impregnated graphite impervious to liquids under high pressures; it possesses high heat transfer values and is resistant to practically all acids, alkalis and solvents.

The exchangers are of plate type, employing the principle of extended, or corrugated, surface to attain maximum heat transfer area without bulkiness. Installation requirements and economical manufacturing methods caused National Carbon Company to adopt four standard design groups incorporating both parallel and series flow channels, thus making possible 30 different combinations to meet the widest range of heating and cooling requirements.

Professional Directory

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Complete services, including solution analyses, process development and deposit tests.
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War plating plants designed and streamlined for increased production.
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LIMITED FOAM BLANKET

HELP WANTED!

Here's one "help wanted" problem that's easily solved . . . even in these days of man-power shortages. If it's a problem in metal cleaning and working . . . the Diversey D-Man is always on deck to lend a helping hand. Backed by a Research Laboratory that has spent 18 years developing special purpose products, the Diversey D-Man can often show you ways to step-up production that require less man-power.

DIVERSEY D-MAN

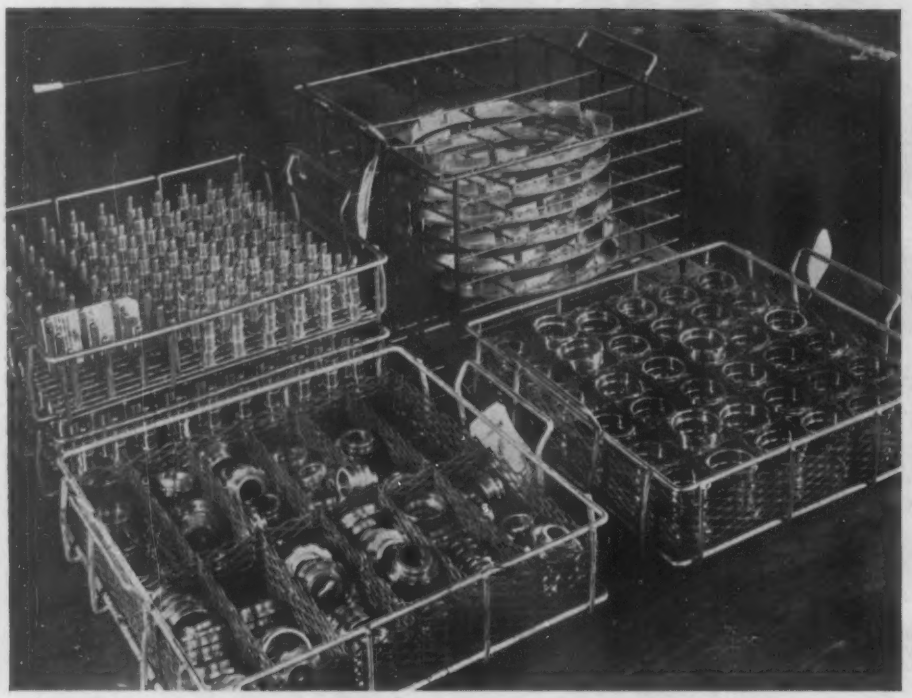
When the foam on an electro cleaning bath piles up until it touches the bus bar, *look out for trouble!* All it takes is a single spark . . . jumping to the bus bar as work is removed . . . to touch off a costly, nerve-shattering explosion that sprays alkaline solution in all directions. Often the nearby pickling and plating baths are contaminated which means more trouble and expense.

Avoid the danger of hydrogen explosions in your electro cleaning bath by using Diversey D-C No. 12. Because of the presence of special detergents and wetting agents, D-C No. 12 develops a *limited* foam blanket on the surface of the bath . . . thus eliminating this danger.

Because of its unique ionic characteristics, D-C No. 12 is an extremely efficient conductor which in turn serves the dual purpose of enhancing cleaning action and conserving current. Has high emulsifying and wetting properties, is free-rinsing in cold water, and prevents hard water deposits from settling on the work and tank. Economical, too, because of its longer solution life.

D-C No. 12 permits the use of reverse current to remove oil, smut and dirt from brass, bronze and copper without danger of attacking the surface. For liberal experimental sample, write Metal Industries Department.

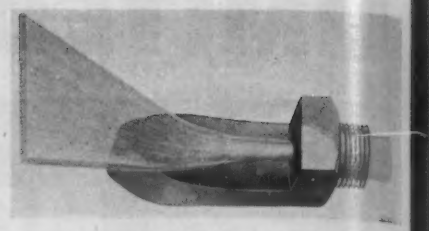
THE DIVERSEY CORPORATION
53 W. Jackson Blvd., Chicago 4, Ill.



Pads for Degreasing Baskets

A problem frequently encountered in industry is breakage of castings with thin walls, fins and projections by rough handling in degreasing baskets. A related difficulty is the scratching and corroding of highly polished machined parts through contact with degreasing basket surfaces. Heretofore, the practice has necessarily been to use degreasing baskets which either tend to damage the parts or could not of themselves, resist the action of organic solvents.

A recent solution is the development of durable, solvent-proof, rubber-like pads to line degreasing baskets and provide castings and machined parts with a protective cushion while in the degreaser. Made of compar, a vinyl resin derivative compounded by Resistoflex Corporation, Dept. MF, Belleville, N. J., the pads not only provide a cushioning effect but also are completely inert to the action of degreasing solvents, sulphur-base cutting oils, aromatic and aliphatic hydrocarbons, chlorinated hydrocarbons, etc. Unlike wood baskets which pick up and hold small sharp metal particles, the compar pads have no harmful effect whatsoever on highly polished metal surfaces. Smaller wire degreasing baskets (shown here) which save handling parts may be coated with a solution of the same resin, which is easily applied by a single dipping process.



"Flatjet" Spray Nozzle

Designed for use wherever a sharp, flat hard-hitting spray is needed, the "Flatjet" spray nozzle shown here has a wide variety of industrial applications. Among the jobs this nozzle does better and faster than ordinary nozzles are industrial washing and degreasing, descaling operations and various chemical process spraying operations.

The "Flatjet" spray nozzle is built without cores, vanes or other obstructions, depending solely on design to produce the desired spray pattern. Standard nozzles are made of brass, steel, or stainless steel one piece construction. Nozzles may also be made of other materials as the needs of the application dictate.

A flat spray, with sharply defined edges and uniform distribution, is delivered by the "Flatjet" nozzle. All surfaces coming in contact with the liquid sprayed are accurately machined. A wide range of "Flatjet" nozzle sizes are available for performance to meet given specifications.

For example, in spraying water at 40 lbs. pressure, a choice may be made of twenty different "Flatjet" nozzles.

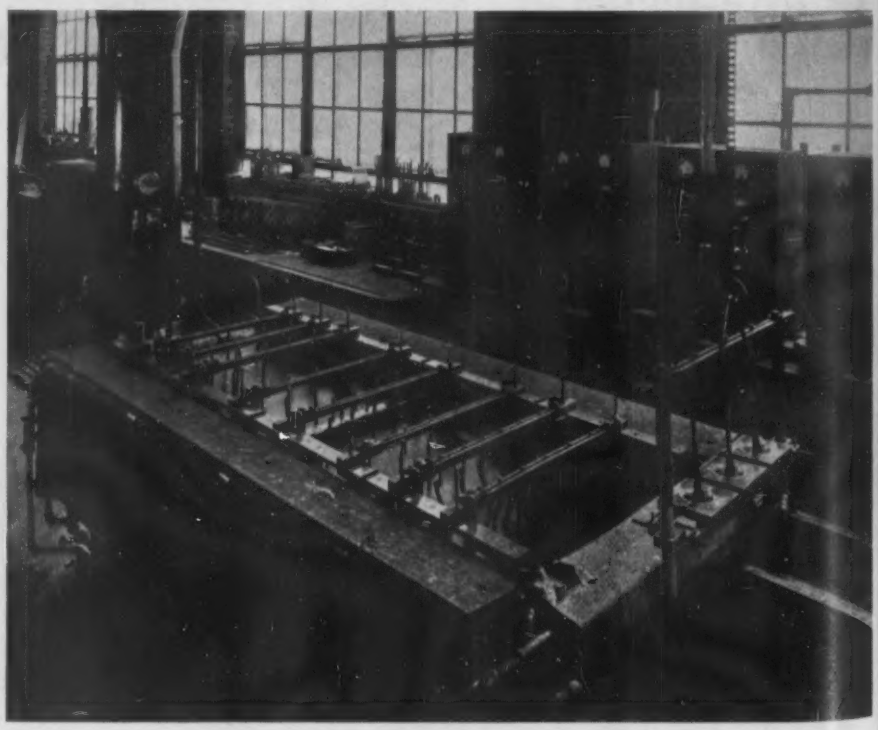
"Flatjet" spray nozzles may be used with water, brine, oil and liquids of similar viscosities. They are manufactured by Spraying Systems Company, Dept. MF, 4039 West Lake St., Chicago 24, Illinois, who will furnish on request complete information on spray nozzles for any spraying job or type of application. A new catalog is available on request—ask for No. 22.

Plating Equipment

Hard chromium plating interests are expected to be furthered by the formation of the Industrial Hard Chromium Plating Equipment Corp., headed by Mr. William A. Crowder, who, since 1937, has also been president and sole owner of the Industrial Hard Chromium Co. of Newark, New Jersey.

The new company is to manufacture equipment for hard chromium plating based upon entirely new principles of design and operations. The new company also holds the exclusive manufacturing rights to hard chromium plating equipment under patents owned by the Metals Protection Corporation of Indianapolis, Indiana, and the manufacturing facilities will be located at 13 Rome Street, Newark, New Jersey, adjoining the site of the Industrial Hard Chromium Co.

The photograph at right shows a typical plating apparatus as developed and built by the company.



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FORMAX GREASELESS COMPOUNDS

for Polishing and Burring

Use Formax Greaseless Compounds on all types of metals and plastics. It is the perfect answer to the need for a compound which eliminates set up polishing wheels in the finer grain sizes. For operations requiring burring, polishing, trimming, breaking sharp corners, removing machine tool marks or for producing brushed or satin finishes, use Formax Greaseless Compound. Immediately available in all grain sizes.

Send for a **FREE** generous sample of our No. E-52 general purpose grade.

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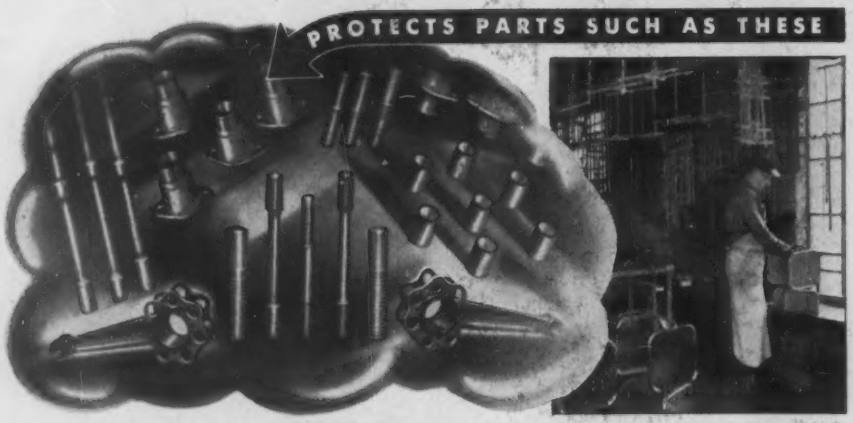
"our new home"

MICCROIL

A HIGH FLASH ANTI-RUST OIL



Especially Suitable For PLATING PLANT USE

In plating plants, where a corrosive atmosphere is always prevalent, Miccroil has proved extremely valuable in protecting metal parts from corrosion and oxidation. As an example, when the O.D. of a part is plated and removed from the plating solution, the I. D. must be protected from corrosion immediately. Immersion in Miccroil protects the non-plated surface.

In actual tests, Miccroil resisted corrosive action almost indefinitely in a plating plant where the relative humidity varied from 92% to 96% at 87° F. Write for full information.

DEVELOPED AND MANUFACTURED BY EXPERIENCED PLATERS

Offers These Features:

HIGH FLASH POINT
Possibility of fire hazard reduced to minimum.

LIGHT IN COLOR
Does not alter appearance of part on which it is applied.

UNIFORM COVERAGE
Assures uniform and effective protective film over entire surface.

NEVER BECOMES RANCID
Contains no ingredients which produce rancid odor.

MICHIGAN CHROME & CHEMICAL CO.
6348 EAST JEFFERSON • DETROIT 7, MICHIGAN

Electroplating Computer

A new and wholly original aid to the electroplater and plating chemist has been made available by the Hanson-Van Winkle-Munning Co., Dept. MF, Matawan, N. J. This instrument is called the Jernstedt Electroplating Computer. It does for the plater what the slide rule accomplishes for the engineer—makes use of logarithmic scales to eliminate lengthy calculations. Accuracy of control and a minimum loss of time are the results, after the plater becomes familiar with its operation.

The instrument accomplishes the following:

1. Computes chemical additions required in a plating bath of any gallonage, including cyanide additions.

2. Indicates weight of metal deposited on unit area, given the thickness. Metal costs can be quickly determined.

3. Lists usual cathode efficiencies of all modern electroplating solutions.

4. Gives plating time required to deposit a given thickness of any metal.

5. Computes current density required to produce a deposit of given thickness.

6. Indicates thickness of deposit resulting from an established plating time at a known current density.

7. Space is provided for recording the standard composition of 20 different plating solutions. The normal temperature of operation and gallonage of each solution can also be recorded.

8. Lists component parts, in percent by weight, of salts commonly used in electroplating.

9. Lists commonly used metric conversion equivalents.

Full instructions and details of the operation of the electroplating computer are available on request.

Barel-Cel Plating Unit

The demand for a small compact barrel plating unit has been met by the Precimet Laboratories. They have recently put on the market a two gallon barrel plating unit which although originally designed for the plating of precious metal, is also being used satisfactorily in copper, nickel, brass, silver plating, etc.

The Barel-Cel is simply constructed: it consists of adjustable cathode and anode, a tilted tub which rotates slowly during the plating operation. The power unit electric

motor can be plugged into any convenient outlet, no special wiring is necessary. The plating current supply to the unit is furnished by means of two wire leads that are fastened to the plating current bars. A special feature of the construction is the tub which is removable to permit flexibility in handling the solution such as raising to the proper temperature, etc., before plating.

The Barel-Cel is particularly suited to the plating of such small pieces as springs, catches, rings, ear wires, pins, screws, etc. There is no waste of materials such as occurs in the basket method of plating. Several plating houses doing government work, have found the unit a time and labor saving device. Perhaps its outstanding advantage is its size, which is unique in the field of barrel plating.

Pamphlets with further information may be obtained by writing to Precimet Laboratories, Dept. MF, 64 Fulton Street, New York 7, N. Y., Division of George C. Lambros.

AVAILABLE IMMEDIATELY!

This transparent glass tank by "Pittsburgh" is used in the plant of C. G. Conn, Ltd., Elkhart, Ind., to check air pressure in various components for Radar. Obviously, the all-glass tank is extremely well suited for this unusual type of testing.

TANKS OF PITTSBURGH GLASS

PRODUCTION men in many vital industries have one less worry since glass tanks came along—and proved their usefulness and durability.

Glass tanks by "Pittsburgh" are tough. They are non-porous, non-absorptive. They don't contaminate their contents. They are impervious to acids, alkalis, nearly all liquids. They can even handle hot chromic acid!

These tanks are made of specially *tempered* glass. They have the strength and sturdiness for long service under hard usage, and the ability to withstand the shock of sharp temperature changes.

A wide variety of types and sizes assures a tank for every need. You can get them faced with glass inside and out. Or with inner facing of glass only. You can get transparent tanks or tanks made of Carrara Structural Glass, which is opaque and comes in numerous attractive colors. Or a crew of Pittsburgh workmen can line your *present* tanks with glass.

Write us today, explaining your specific tank requirements. We will gladly work with you on the application of glass tanks by "Pittsburgh" to your own needs. Pittsburgh Plate Glass Company, 2232-4 Grant Building, Pittsburgh 19, Pa.

"PITTSBURGH" stands for Quality Glass and Paint

PITTSBURGH PLATE GLASS COMPANY

UNICHROME
"QUICK DRY"
STOP-OFF 322

for better results in cyanide solutions

No need to worry about peeling or seepage when you have Unichrome Stop-Off 322 on the work. *Remember that number 322.* It marks a special lacquer formulation that—although applied at room temperature and quick-drying—holds like a bull dog even in the toughest plating solutions. It's compounded with special resins and solvents that W. P. B. is extremely reluctant to dole out. That's why we can't *always* give you immediate delivery. But Unichrome Stop-Off 322 is worth waiting for—because it gives you extra speed and convenience in handling, hairline accuracy on the work, better production per man-hour. Write for your trial order today.

* Reg. U. S. Pat. Off.

PROPERTIES

Chemical Resistance — Excellent in all plating cycles.

Application—Can be brushed or dipped—successive coating is minimized.

Drying — Dries quickly at room temperature—adheres without force drying.

Stripping —Due to extreme adherence, material is usually dissolved off after plating.

UNITED CHROMIUM, INCORPORATED

51 East 42nd St., New York 17, N. Y. • 2751 E. Jefferson Ave., Detroit 7, Mich. • Waterbury 90, Conn.

TRY THESE OTHER UNICHROME MATERIALS

Unichrome Quick-Dry Stop-Off 322—for chromium and other work requiring a stop-off that can be peeled off after use.

Unichrome "Air Dry" Rack Coating—a rack insulation that can be dipped and dried at room temperature, for use in all plating solutions.

Unichrome Coating 202—a new rack insulation similar to "Air Dry" but which is force dried to obtain the extra adherence required in anodizing and hot, strongly alkaline solutions.

Unichrome Resist—a solid insulating material for constructing composite racks, stop-off shields, insulating gaskets, etc.

Leroy Camel

The promotion of *Leroy Camel*, Cleveland, to sales manager of the Alkali Division has been announced by *W. W. Davidson*, vice-president in charge of sales of *Detrex Corporation*, Detroit 27, Michigan. Mr. Camel was previously manager of the Eastern section of the Alkali Division with offices in Cleveland, Ohio.

The continued expansion of business in this division has brought about the necessity for a larger sales organization. Mr. Camel brings to his new headquarters in Detroit wide field, laboratory, sales and service experience in the cleaning industry.

The promotions of *Joel Cooper*, Detroit, and *Herman Grosser*, Cleveland, as division managers in their respective territories were also announced.

The *Barber-Colman Company* announces the appointment of the *Wain Engineering Company*, Omaha, Nebraska, as its distributor for Control and Air Distribution Products in the Omaha territory.

Mr. Wain of the above organization has been long associated with the heating, ventilating, and air conditioning industry, and is well known to the users of this type equipment.

Special Chemicals Company, 30 Irving Place, New York City announces the appointments of *Ralph H. Lee* and *Walter H. Pearce* to its staff.

Ralph H. Lee's duties will comprise office management, sales and sales promotion. Mr. Lee brings with him 17 years of experience obtained with the Grasselli and Electrochemical Divisions of DuPont and his many friends will have the benefit of this technical background.

Walter H. Pearce, who will act as development engineer, at one time was Instructor of Chemistry and Librarian of City College, New York, and more recently with Weisberg and Greenwald and W. L. Maxson Corporation. Mr. Pearce will handle the chemical, research and development work.

Business Items

Quaker Chemical Products Corp., Conshohocken, Pa., manufacturers of cutting and grinding coolants, metal cleaning and rust-preventive compounds and other chemical specialties for the metal working industry, have made the following recent additions to their staff of field engineers:

Stanley Brink, a specialist in grinding and formerly employed as a process engineer in Cadillac's Allison Division in Detroit, is now working with Quaker process engineers in various parts of the country in the introduction and application of a new grinding technique.

Another grinding specialist, *J. D. Neville*, formerly with Pratt & Whitney in Hartford, is representing Quaker in the western section of Connecticut.

J. H. Lightner, until recently Chief of Production Unit of the Army Inspection Office in a large eastern ordnance manufacturing plant, is now covering the northeastern portion of Pennsylvania for Quaker.

Still another addition to Quaker's staff is *Burdette F. Wilson*, a Purdue graduate who for three years held the position of chief chemist at the Eclipse Division of Bendix Aviation, and for the past three years has held the same post at Studebaker's Aviation Division in South Bend. Mr. Wilson will do liaison work between Quaker's research laboratories, manufacturing plants and the field and will take charge of coordinating development work with production needs and trends.

In refining precious metal . . . scrap and waste we have always done everything possible to assure such a high degree of accuracy and promptness of service

that those who ship to us <u>once</u> will have every reason to do so <u>again.</u> Result . . . every year more manufacturers start shipping gold, silver and platinum scrap and waste to us <u>regularly.</u>

Try us with your next shipment.

HANDY & HARMAN

82 Fulton Street, New York 7, N. Y.

Service Plant
82 Fulton Street,
New York 7, N. Y.
Phone: Beekman 3-2460

Principal Plant—Bridgeport 9, Conn.
Phone: Bridgeport 9-1681
Chicago Office—Phone: Franklin-8068

Service Plant
425 Richmond Street,
Providence 3, R. I.
Phone: Dexter 4795

Ingenious New
Technical Methods
Presented in the hope that they will prove interesting and useful to you.
HAND GROUND
MACHINE GROUND

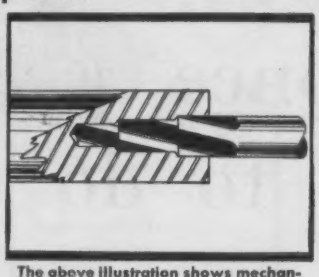
New Precision Step Drill Grinder Simplifies Production and Maintenance of Step Drills

The quality of a step drill produced by common methods depends almost entirely on the skill and attention of the individual tool maker. However, with the development of the precision step drill grinder, the human element has been entirely eliminated, the characteristics of the step being completely controlled by the grinding machine without adjustments during the course of grinding. This automatic feature insures absolute uniformity, regardless of quantity, and permits large-volume production of step drills.

The apparent advantages gained through the use of the step drill grinder are: Permits mass production of drills ground to exact specifications, entirely independent of the human element. Maintenance, too, is no longer an obstacle as step drills produced by this method are quickly sharpened by the same uniform machine-controlled operation. With the step drill grinder step drills can now be made from standard drills. These advantages result in a wider application of step drills which provide a definite saving of machine tools, man-hours and cost; this in turn results in greater production.

You know there are plenty of benefits in chewing gum, too. That's why all of the Wrigley's Spearmint we're able to make from our available stocks is going overseas to our fighting men and women. You know what a lift it's been on the job and we wish we could supply everybody, because we have pride, too, in our workmanship and productivity. But there just aren't enough available top quality raw materials right now to do it. When we can produce it in sufficient quantity, it will be back to you with the same fine flavor and chewing satisfaction ...Wrigley's Spearmint has never been changed!

You can get complete information from Spiral Mfg. Corp., 5022 North Kedzie Avenue, Chicago 25, Ill.



The above illustration shows mechanical design which requires a hole having diameters diminishing in steps. This is an operation for step drills which has often been neglected due to difficulty in obtaining and maintaining step drills.

Step drills produced by our method are quickly sharpened by the same uniform, machine-controlled method.

Y-125

Tivit Products, Inc., has purchased the *Torrance Steam Cleaner Company* and moved its main offices to the Torrance factory at 1026 Engracia Avenue, Torrance, California.

Tivit continues the manufacture of Torrance Steam Vapor cleaners in addition to its own steam machine and the full line of specialized equipment which Tivit has developed for metal processing and cleaning.

Bruce Wiswall and *M. P. Greffoz*, executives of the original Tivit Company, retain their positions as general manager and production engineer. *L. B. Buckley*, Torrance plant superintendent, has been appointed plant superintendent for the combined organization.

V. H. Hiermeier has been named industrial manager of the St. Louis office of the *Brown Instrument Co.*, Philadelphia precision industrial instrument division of *Minneapolis-Honeywell Regulator Co.*

Mr. Hiermeier, who succeeds *I. K. Farley*, has had 15 years experience in the industrial instrument field. For the past few years he has been with the Brown company in its Chicago office. Mr. Hiermeier is credited with doing much to help Purdue University establish and operate an instrumentation course.

W. I. Tebo, chief engineer of *Detrex Corporation*, Detroit, manufacturers of metal cleaning equipment, chemical cleaning compounds, oil-extraction plants and dry cleaning machinery, has announced two appointments in the Engineering Department of the firm.

T. J. Kearney

Thomas J. Kearney, formerly technical advisor to the director of sales, has been promoted to assistant chief engineer in charge of industrial equipment design and detailing. Mr. Kearney has been associated with the company for ten years and has wide experience in sales, service, production and engineering capacities. In addition to supervision of the drafting department and the general development of Detrex industrial cleaning equipment (degreasers and washers), Mr. Kearney will have charge of machine design in the preparation of customer quotations.

J. A. Faler

John A. Faler, assistant chief engineer of the company has been appointed to the charge of extraction equipment development.

B. D. Divine, president of *Divine Brothers Company*, buffing wheels, casters and industrial truck wheels, and machinery manufacturers of this city, officially confirmed the report that Divine Brothers Company had purchased the property of the former *Iroquoit Paper Company* at 200 Seward Avenue, Utica. Possession will be given July 1st, but complete removal from 102 Whitesboro Street will not be effected for several months.

The move is as a result of natural expansion and was not influenced by war contracts. This new location will double the present square footage of floor space. It is ideally suited to heavy manufacturing operations and has double spur tracks on two railroads.

The Seward Avenue plant is adjacent to the Divine Brothers Company machinery manufacturing plant, the Munson Mill Machinery Company. The total acreage of property is over 13; the total floor space of the two plants about 150,000 square feet.

New officers of Los Angeles Chapter, *American Society of Metals*, are: *C. E. Carlson*, Aluminum Co. of America, president; *D. McElfish*, Kilsby and Graham, vice-president; *W. J. Parsons*, Pacific Scientific Co., secretary-treasurer. The educational section of the chapter's last meeting was featured by a talk on "Cold Finished Steel" by *Fred J. Robbins*, metallurgist of the Columbia Tool Co.

Wyandotte Chemicals Corporation has recently announced the formation of their new Development Department which will be headed by *J. J. Schaefer*.

About five years ago Wyandotte Chemicals Corporation embarked on an organic research program and the development of both organic and inorganic products will now be handled by this new department.

Mr. Schaefer is a graduate of the University of Dayton and the Massachusetts Institute of Technology. He was a member of the technical staff of *Niacet Chemicals Corporation* of Niagara Falls from 1928 to 1934. In 1934 he became director of research for *Harples Chemicals Incorporated* and was a vice-president of that company from 1936 until his recent resignation.

Mr. Schaefer is a member of the American Chemical Society, the American Institute of Chemical Engineers, and of the Chemists Club of New York.

Wyandotte Chemicals Corporation research, development and sales executives recently inspected the Wyandotte Chemicals Corporation organic pilot plant. Shown from left to right are *Dr. W. F. Waldeck* and *Dr. Thomas Vaughn* of the research department, *J. J. Schaefer*, director of development and *Laurence D. Linke*, his assistant, *Howard F. Goderick*, director of research, and *Carter B. Robinson*, vice-president in charge of sales, B. B. Ford Division of Wyandotte Chemicals Corporation.

UNICHROME*
COATING 202

For extra protection in hot, strongly alkaline solutions

HERE'S A COATING which adheres to plating racks with utmost tenacity . . . resists strongly alkaline solutions effectively . . . holds up *longer* under severe cycles, anodizing baths and extremely corrosive solutions.

There are two good reasons. Unichrome Coating 202 is compounded of improved resins that offer utmost chemical resistance. It is specially formulated for force drying that develops extra toughness and adherence.

And we haven't let current restrictions on these hard-to-get resins alter the formula in any way. If you want *maximum* life from your plating racks, order a trial shipment now. For further information, prices or an initial order, write to nearest office listed below. * Reg. U. S. Pat. Off.

PROPERTIES

Chemical Resistance—Excellent for all plating cycles.

Toughness—Withstands repeated flexing and shop handling—cuts cleanly and easily at contacts.

Drying—Dipped at room temperature in container in which it is shipped—Force-dried at 200° F. for extra protection.

Adherence—Excellent for severe cycles. For moderate cycles "Air Dry" coating is recommended.

UNITED CHROMIUM, INCORPORATED

51 East 42nd St., New York 17, N. Y. • 2751 E. Jefferson Ave., Detroit 7, Mich. • Waterbury 90, Conn.

TRY THESE OTHER UNICHROME MATERIALS

Unichrome "Air Dry" Rack Coating—a rack insulation that can be dipped and dried at room temperature, for use in all plating solutions.

Unichrome Quick Dry Stop-Off 322—for cyanide copper and other plating work requiring an extremely adherent stop-off.

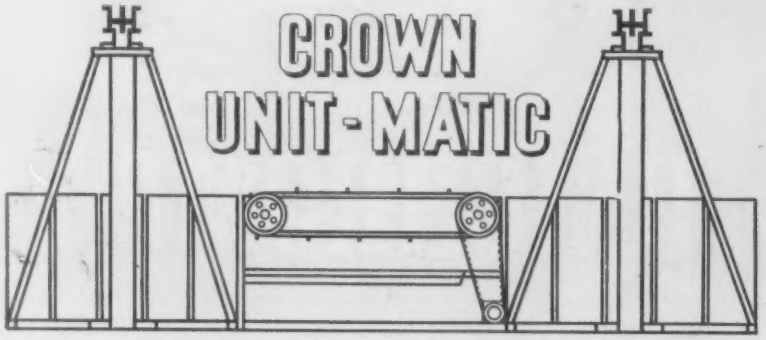
Unichrome Quick Dry Stop-Off 323—for chromium and other plating work requiring a stop-off that can be peeled off after use.

Unichrome Resist—a solid insulating material for constructing composite racks, stop-off shields, insulating gaskets, etc.

Wyandotte Research, Development and Sales Executives Inspect Organic Pilot Plant.

Crown

BRINGS TO THE PLATING INDUSTRY THE OUTSTANDING EQUIPMENT DEVELOPMENT DURING THE PAST QUARTER OF A CENTURY



(PATENT APPLIED FOR)

FULLY AUTOMATIC
PARTIALLY AUTOMATIC
EQUIPMENT

FOR
PLATING
ANODIZING
CLEANING
PICKLING

CROWN RHEOSTAT & SUPPLY CO.
1910 MAYPOLE AVE. CHICAGO, ILL.

4 STAR GENERALS PLAN FOR VICTORY

4A Products for the Perfect Finish

COMPOUNDS:— Cutting Down, Polishing, Mirror Finishing and Burring. We have many new numbers. Many large plants are using these Compounds 24 hours a day.

4A CEMENT:— Used to make up Polishing Wheels, Rolls, Belts, Buffs and etc., is very economical and will save you valuable time and money.

Samples of Compounds or Cement on request.

HARRISON and COMPANY
Haverhill, Mass.

Alpha Metals, Inc., is the new corporate title of the former *Alpha Metal & Rolling Mills, Inc.*, of Brooklyn, N. Y., well-known producers and fabricators of lead products for four generations, according to an announcement by *Mr. Harold Shonberg*, president and general manager of the firm.

With the announcement of the new company name, Shonberg said: "After many years of successful operation, a firm is usually reluctant to make any change in its corporate name, but the old name tended to restrict the field in which we operate. As a matter of fact rolling is only one of the many processes employed in the manufacture of a vast variety of standard extruded, cast, stamped and fabricated solder and lead products."

Shonberg further stated that: "As present and post-war plans for heavy expansion in correlated fields of operation will extend far beyond the function indicated by the old corporate name in the rolling field, simplification and brevity of title will cover many of the present and future activities."

With the adoption of the new name, an attractive new trade-mark is being introduced. No change, however, has been made in either company policies or executives. The offices and plant of Alpha Metals, Inc. are located at 363 Hudson Avenue, Brooklyn 1, N. Y.

A. H. Kruger, associated with the industrial heating and processing industries for the past 19 years, has joined *Wheelco Instruments Company*, Chicago, as application engineer, it has been announced by Richard Schoenfeld, vice-president in charge of sales.

Kruger will be engaged primarily in introducing to the industrial heating and processing industries the Wheelco company's new line of Inputrol and Throttltrol instruments. He was among the first to apply automatic temperature and furnace pressure control to industrial furnaces and boilers, and since 1941 was vice-president in charge of sales and estimating for the Vulcan Corporation.

At the 13th annual meeting of the *Porcelain Enamel Institute* in Cleveland, Ohio, *Mr. Richard H. Turk*, executive vice-president of the *Pemco Corporation* of Baltimore, was elected president.

Mr. Turk has long been active in the affairs of the Institute, having served as vice-president for several years. Still a young man, he has spent a long number of years in the porcelain enameling industry and for the past twenty years has been actively associated with the Pemco Corporation. He was elected as a Fellow of the American Ceramic Society in 1936, and with his father, *Mr. Karl Turk, Sr.*, was the recipient of the Modern Pioneers Award in 1940, presented by the National Association of Manufacturers.

Sam Tour & Co., Inc., engineers, metallurgists and consultants, are now located in their building at 44 Trinity Place, New York 6, N. Y.

Associations and Societies

AMERICAN ELECTROPLATERS' SOCIETY

Los Angeles Branch

A discussion of present-day lacquers was sented at the educational session of the al meeting of the season of Los Angeles anch, A.E.S., June 12, at the Rosslyn tel, by *E. P. Hanson*, chemist of the *An- ew Brown Co.*

Mr. Hanson first discussed the various es of lacquers now in general use in the tal finishing industry and then gave a umé of their respective properties and nctions.

For the past several years, he explained, paint companies have been devoting their ergies to the production of large quanti- s of coating materials for war-time proc- es. These coatings, the speaker pointed , are subjected to severe conditions rang- from extreme desert heat to sub-zero peratures. The coatings, he explained, st take the expansion without cracking or eling, and must also be able to endure impact of sand storms and the corrosive ct of salt spray.

Mr. Hanson explained the method of ating cotton linters with nitric and sul- uric acid to make nitro-cellulose and stated t the trend now is toward a low viscosity ro-cellulose which makes possible a higher- ids lacquer. He also discussed the hot ay method of applying high-solids high- cosity lacquer and predicted that further velopments in the field of cellulose lacquers ll undoubtedly take place after the war.

The second speaker was *D. N. Eldred* of Pacific Division of the Du Pont Co., who e a demonstration, accompanied by de- iptive commentary, of the Hull cell for ing plating solutions. Assembling a Hull ll, complete with receptacle, generator, ostat, ammeter and other parts, Mr. red explained the component sections the speedy and definite results in making ution tests which can be obtained with Hull cell.

The speaker exhibited sample steel plates ch had been treated with solutions tested Hull cells at high and low density cur- s, and accompanied the exhibition with explanation of the range of current den- es which can be used in such tests.

PORCELAIN ENAMEL INSTITUTE

The Porcelain Enamel Institute held its Annal Meeting at Cleveland, Ohio, e 6th and 7th.

The following officers were elected:

. H. Turk, president. Mr. Turk is execu- vice-president of the Pemco Corporation Baltimore, Maryland.

. J. Heyer, vice-president. Mr. Heyer is ident of the Chattanooga Stamping & meling Company, Chattanooga, Tenn.

oseph T. Penton, vice-president. Mr. ton is president of the California Metal meling Company, of Los Angeles, Calif.

m. Hogenson, treasurer. Mr. Hogenson resident of the Chicago Vitreous Enamel

"Here it is, Bud"

PURITAN *Stainless Composition* ⩽550

New 2 in 1, comparatively dry and greaseless composition bar for *double duty* action on the production front. With a single bar of Purico ⩽550 you can . . .

Cut the Color Before Chrome Plating

Produce a High Luster After Plating

Purico ⩽550 is unexcelled for all precision finishing of gun parts that are chrome plated as its special qualities eliminate many usual operations, thereby speeding up production . . . ⩽550 is equally good for any finishing, prior to chrome plating, job where speed and performance are of first concern.

• • •

PURITAN *Pur-Bur* A new, fast and efficient, compound for the deburring of aluminum that is self-lubricating and cools and eliminates burning of metal or surrounding area.

PURITAN *Wonderbar* Patented, pre-saponified Tripoli buffing composition that is greaseless and therefore eliminates usual brushing and scrubbing operations.

PURITAN *H-T-S* New high temperature salts developed for complete removal of scale from iron, steel, monel metals and alloys after heat treatment.

Start with a Good Finish

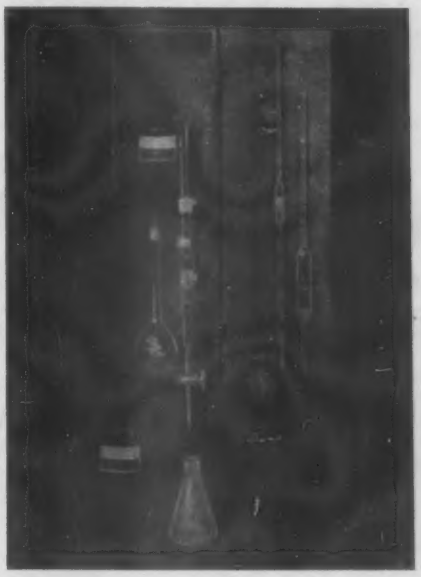
The experience and wide variety of Purico products has helped many to "Start with a Good Finish" and the Puritan distributors listed are more than willing and able to help you with your finishing production. 'Phone or write your nearest distributor about Purico products.

NATIONAL DISTRIBUTORS

L. H. BUTCHER CO.	Los Angeles
JACOB HAY COMPANY	Chicago
REYNOLDS-ROBSON CO.	Philadelphia
SESSIONS-GIFFORD CO.	Providence
W. D. FORBES	Minneapolis

THE Puritan MANUFACTURING COMPANY

WATERBURY, CONNECTICUT



CONTROL ANODIZING SOLUTIONS

Simple inexpensive test sets enable you to rapidly determine the total, free and combined acids in CHROMIC or SULFURIC ACID anodizing solutions.

Sets for testing plating solutions also available.

Write for literature.

KOCOUR CO.

4720 S. CHRISTIANA AVE.

CHICAGO 32, ILL.

Product Company, Cicero, Illinois.

Following the acceptance of the resignation of *Charles S. Pearce* as secretary and managing director, *Edward Mackasek* was elected to this post. Mr. Mackasek was formerly executive vice-president of the Beaver Enameling Company, of Ellwood City, Pennsylvania. He will be located at the Institute headquarters in Washington, D. C., where he has been acting as development engineer for the last six months.

J. F. Sweeny, of Walker & Downing, Pittsburgh, showed complete layouts of the many booklets and pieces of advertising which the Institute is doing in the present year. These new advertising pieces are available to the members now.

METAL FINISHING SOCIETY

Metal Finishing Society of Rockford, Illinois, will hold their 3rd Annual Picnic August 5th. There will be a baseball game, horse shoe pitching, casting and cards. Last year's winners will be hard pressed for honors. Sandwiches, beer and soft drinks to be served to curb the outdoor appetite. A large turnout is expected again.

Manufacturers' Literature

Temperature Controls

Sarco Company, Dept. MF, 475 Fifth Ave., New York 17, N. Y., has issued a new bulletin, No. 650, describing special temperature controls for degreasing and other metal cleaning machines.

Simple self-operated controls for both heating and cooling are said to maintain vapor lines on degreasers within narrow limits. At the same time they are claimed to effect substantial savings in solvent and water.

The bulletin gives complete description and includes installation details, capacity tables, and other engineering data.

pH Control Handbook

Celebrating its 25th anniversary, the *LaMotte Chemical Products Co.*, Dept. MF, Towson 4, Baltimore, Maryland, presents a new, 84-page edition of its well-known handbook, "The A B C of pH Control."

Always informative, this attractive manual has been revised and enlarged in this, its 12th edition, to become the most comprehensive handbook yet published by the company.

Its up-to-the-minute information and general catalog section describing the full line of LaMotte equipment and chemical reagents should prove to be most valuable to those interested in the process industries; analysis of water, sewage, and industrial wastes; boiler feed water; electroplating; soil testing; and other fields requiring specialized controls.

Anodes and Plating Chemicals

A new booklet on anodes and plating chemicals, Bulletin AC-105 has been issued by the *Hanson-Van Winkle-Munning Co.*, Dept. MF, Matawan, N. J. This booklet includes data on their anodes of nickel, brass, copper, zinc, cadmium, tin, lead, silver and anodes for chromium plating.

The plating chemicals described include salts and chemicals for plating nickel, black nickel, zinc, cadmium, tin, lead and silver, also sodium cyanide.

Processes covered are: H-VW-M Bright Cobalt Nickel (High Cobalt, Type 5 and 9H); Mazic Bright Zinc; SB Zinc; Caduz Cadmium; Protecto Lead Concentrates; B-H Lead.

Another important item included in this bulletin is the synthetic Resin Anode Bag. A section is devoted to Solution Control including data on the Jernstedt Electroplating Computer and a table giving the component parts in per cent by weight, of salts commonly used in electroplating.

Baffles and Furnaces

Much greater fuel economy or greater steam generating capacity can be obtained by modernizing baffles and furnaces.

The Ramtite Co.'s new bulletin explains and illustrates how significant economy can be effected by proper design. It presents blueprints showing the old and new locations of baffles together with an account of savings made in each case. The bulletin entitled "Economy Boiler Baffles" may be obtained from The Ramtite Co., Division of The S. Obermeyer Co., Dept. MF, 2563 West 18th Street, Chicago 8, Illinois.

The Tarnish Resisting Plate

Adheres firmly to base metal and will not peel or crack

•

ECONOMICAL; EASY TO OPERATE

NU-WHITE makes possible the richness and beauty of a quality finish at low cost that will increase sales.

•

NU-WHITE PRODUCTS COMPANY

ELECTROPLATING RESEARCH

2288 UNIVERSITY AVENUE ST. PAUL 4, MINNESOTA

Hammond

OF KALAMAZOO

ROTARY AUTOMATICS

FOR DEBURRING BRUSHING POLISHING AND BUFFING

Write for Bulletin 401

Hammond Machinery Builders, Inc.

1601 Douglas Ave., Kalamazoo 54, Mich.

Eastern Branch: 71 West 23rd St., New York 10, N. Y.

NEW CONTRACTS

May Depend

On how closely your costs are figured. The new NOBS pre-plating and aluminum cleaners are specifically developed to lower your costs in the coming days of close competition.

NOBS CHEMICAL COMPANY

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News from California
By FRED A. HERR

Walter Kidde & Company, Belleville, N. J., announces the opening of a new sales and engineering office at 9507 Santa Monica Boulevard, Beverly Hills, California. *John M. Noble*, who for the last four years has been manager of the Aviation Department at Kidde, has been appointed district manager in charge of the new West Coast office.

Mr. Noble was formerly manager of the Flight Instruments Department and assistant to the manager of the Friez division of *Bendix Aviation Corporation*, Baltimore, Md. In that work he was concerned with the engineering, sale and production of flight and recording equipment used for research and routine operations by the armed services and scheduled airlines. Other Friez products with which he was concerned were recording instruments used in weather research for aviation applications.

Prior to that time, he was chief mapping pilot of Aero Service Corporation of Philadelphia, the largest commercial aerial photographic mapping organization in this country. In this work he flew all over the U. S. at altitudes ranging up to 25,000 ft. and seldom under 15,000 ft.

He also served as a pilot for Pan American Airways in their Western Division, flying through Mexico and across the Central American jungles to Panama.

A graduate from Harvard in 1929, where he took his training in the U. S. Naval Reserve Aviation, Mr. Noble went directly into active duty with the battle fleet of the Navy. He spent a year flying as a pilot from the ill-fated U. S. S. *Lexington*. He also flew for some time from the U. S. S. *Saratoga* and had active duty at many of our Naval air stations round the world. Mr. Noble has also had some Army duty, having been in the Missouri National Guard 110th Observation Squadron while attending a preparatory school at St. Louis.

William Brockus, formerly with *Modern Plating Co.*, Los Angeles where he had been active on a government contract involving the brass plating of the steel rims for Army tank treads, has opened his own shop, the *Brockus Plating Works*, in Monterey Park, a Los Angeles suburb.

Mr. Brockus has equipped a small backyard shop near his home and is specializing in finishing antique table ornaments, metal lamp shades, etc. Much of this work consists of polishing and oxidizing old lamp shades in brass and copper finishes. When he started to equip his new shop, Brockus discovered that reports of a machinery shortage in Southern California were not exaggerated. In consequence, he found it necessary to supplement the few small metal tanks he was able to obtain with 10-gallon crocks and other types of containers to serve as "tanks" until the equipment situation eases.

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Marcus D. Rynkofs, proprietor of *Liberty Plating Co.*, Los Angeles, in June sold his No. 2 Plant, 1334 West Street, to *Al Spicer* and *Spence Wright*.

The shop had been headquarters of Rynkofs' metal finishing activity from until 1936, when he opened his present 1 Plant at 525 North LaBrea Avenue, Hollywood.

The 25th Street shop had been idle the past year, at which time a contract bright nickeling and chromium plating *Scovil Mfg. Co.* was terminated due to decision of the company not to have more such work done in Southern California. The shop contains approximately 2,000 ft. of floor area. It is equipped with tanks of miscellaneous size for chromium, cadmium, zinc and bright nickel work, well as with polishing lathes, generators a complete setup of other equipment.

With son *Jean* in the Marine Corps, son *Stanley*, foreman until recently of LaBrea Avenue shop, in the Navy, the power shortage in the metal finishing industry in Southern California is so pronounced particularly in the classification of experienced shop supervisors and platers, Mr. Rynkofs found it impossible to replace his sons and decided to dispose of one the shops.

Considerable new plating tank equipment has been installed in the metal finishing department of the *Douglas Aircraft Co.* Long Beach plant, according to *E. R. Williams*, co-ordinating supervisor of the firm's various Southern California finishing departments at Long Beach, Santa Monica and El Segundo.

Recent installations at Long Beach, Williams reported, include a 2,500-gallon zinc tank, a 400-gallon Cronak tank; and 1,200-gallon combination tank unit for pickling, rinsing and neutralizing. This latter tank includes a 400-gallon electric pickle section.

"I HAD A NIGHTMARE LAST NIGHT, JOE. I DREAMT YOU TOOK THE DAY OFF!"

Joseph Barton of the *M. E. Baker Co.*, Cambridge, Mass., was in Los Angeles on a business trip the first week in June. Joe came on a buying mission for used rectifiers, generators, rheostats and other plating plant equipment.

Stanley Rynkofs, son of Marcus Rynkofs of the Liberty Plating Co., Hollywood, where he has been serving as shop superintendent for a number of years, reported for duty in the U. S. Navy on June 20. It is regarded as likely that he will apply for a rating in the technical section because of his well-rounded knowledge of electrodeposition and other phases of metal finishing.

Edward A. Molitor has sold the *Superior Surface Plate Co.*, 2812 West Florence Avenue, Los Angeles, including equipment and tools, to *J. A. Thompson*.

Plans are reported to have been completed for erection of a hot dip galvanizing plant in Salt Lake City, Utah, for the *Lange Co.* of that city.

The production of electrical assemblies, wiring harness for amphibious tanks and electrical testing equipment is keeping the Los Angeles plant of the Electronic Engineering Co. busier than ever in its history.

Turco Products, Inc., 6135 S. Central Ave., Los Angeles, announces building alterations costing approximately $2,000 are underway.

RAY DIETZ

Ray Dietz, 38, head of *Dietz Mfg. Co.*, 2310 South LaCienega Boulevard, Los Angeles, makers of Dietz panchromatic lamps and airport landing lights, died recently at his Los Angeles home. He is survived by his wife and two minor daughters.

The finishing of the Dietz landing lights, now used extensively at airports throughout the country, involves chromium plating. This work was sublet by Dietz to job shops, much of it having been done by *J. T. Newell* of Los Angeles. The finish achieved is said to be equal to silver and non-tarnishing.

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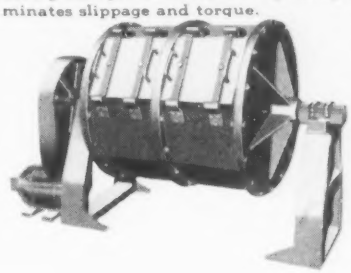
The Burr-Rite series is the solution to today's special finishing problems on hardened metal parts. The Standard is the tilting type that can be loaded and unloaded with a minimum expenditure of time and effort. It's two piece shell of welded steel is lined with seasoned hard wood that cushions the parts against scratching and nicking. Equipped with a low speed gearhead motor.

THE BURR-RITE SENIOR

The Burr-Rite Senior is a double compartment, high production unit, designed for large runs of similar parts. With the Senior, deburring and polishing can be accomplished in a single run. The large double compartment barrels are lined with high quality, seasoned hardwood. Easy loading and unloading are assured by large watertight door openings, equipped with quick acting clamps. Positive, train gearing eliminates slippage and torque.



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Globe's new Direct Motor Drive barrel was designed to produce finer finishes on non-ferrous metal parts. Low tumbling speeds help eliminate nicking and scratching. It'acompactness,achieved by mounting the motor directly on the gear segment, saves space and eliminates the bulk of a double pedestal type. Available in wood or metal shells.

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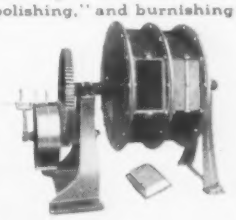
This barrel can be furnished with one, two or three shells. Compartments are narrow and high to achieve high pressures as well as adequate tumbling action. Ideal for cleaning, "low polishing," and burnishing small metal parts. Available in direct motor or belt drive. Motor is mounted directly on main frame and insures positive gear mesh.



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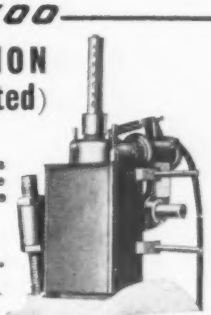

Write for Bulletin 411

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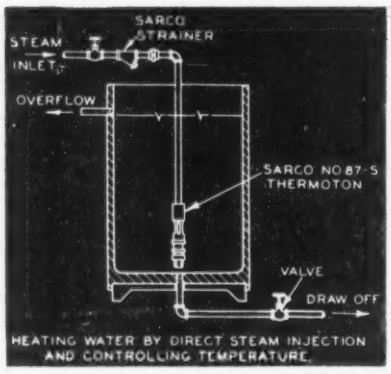

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Suitable for cleaning or rinsing tanks in metal finishing shops or wherever small quantities of water are heated by direct steam injection. Ask for Catalog No. 550.

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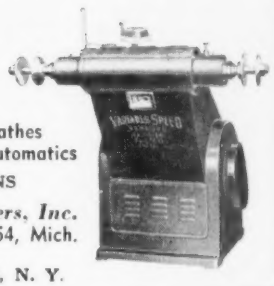

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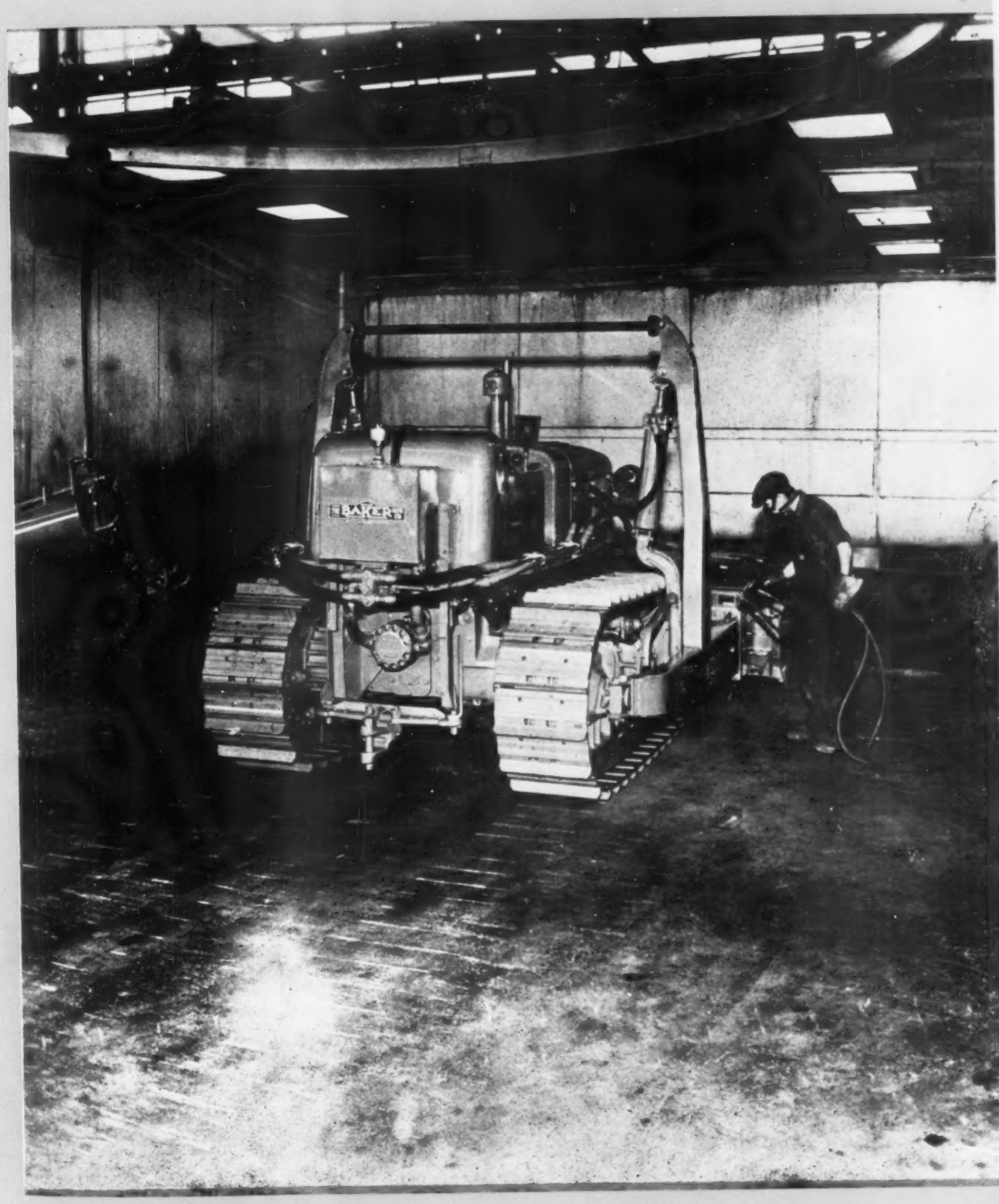
JULY, 1944

ORGANIC FINISHING

SECTION OF METAL FINISHING



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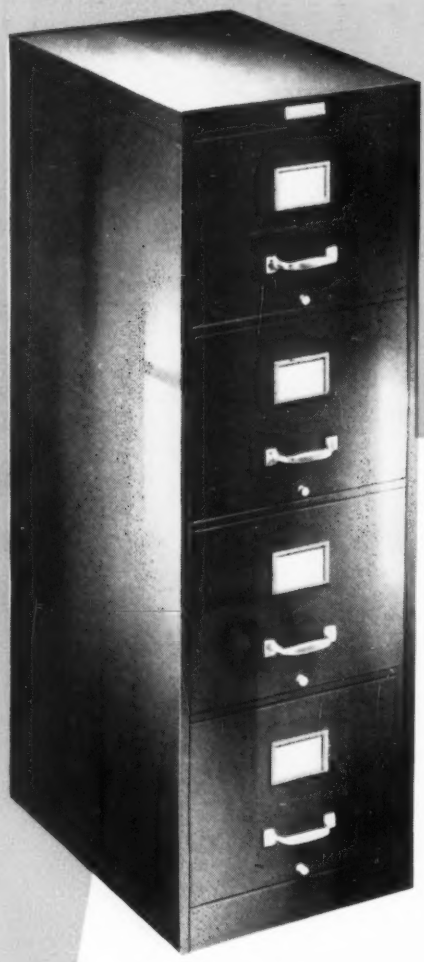

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Protective qualities and durability have too often dominated the finish job. In *Zapon Metalites*, however, appearance is emphasized, as well — to fill an essential need by giving products the high degree of attractiveness that is measured in terms of sales appeal.

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Metalites are metallescent pigmented coatings, formulated on a number of different bases. They serve to brighten and pick up colors; to bring them *alive* with new sparkle and lustre! There are almost endless possibilities *now* for endowing metal products with new appeal, durability, protection and economy through use of Metalite finishes. For example, even the conventional Filing Case Green is more striking, more attractive, when the finish is a glistening Metalite. For Metalites blend harmoniously with formerly-used colors, yet impart an *added* eye-catching lift!

CAN YOU GET METALITES TODAY?

Yes, subject to certain wartime restrictions. For instance, those Metalites which are formulated from oleaginous resinous (varnish) bases are largely available today, and many lacquer enamel base Metalites are also generally obtainable. The high-bake Duranite and Alkyd enamel Metalites, of course, are more closely restricted, depending on the essential nature of the end products.

Whatever your problem, we, at Zapon, want you to call on us *right now*—to show you how Metalites can work on your particular job.

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ORGANIC FINISHING

SECTION OF METAL FINISHING
JULY, 1944

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Cover Photograph

Spraying tractors in water wash spray booth. *Courtesy Binks Mfg. Co., Chicago, Ill.*

High Solid Lacquers

High speed finishing, such as is practiced today, dates from the advent of lacquers. Previous to their adoption and general use, finishing was slow and expensive and the results from the materials available at the time were not always satisfactory. As time went on materials other than lacquers were developed mainly for reasons of cost and for certain characteristics lacking in lacquers. One of the characteristics of lacquers, which focused attention on other types of finishing materials, was their low solids content, with all that meant in terms of number of coats, solvents required, etc.

Lacquers, however, have much to commend them. Certain of their film characteristics have not been entirely duplicated. As regards application, they are still the only "speed" materials which do not require costly and complicated baking or drying installations.

The war, with its emphasis on conservation of labor and solvents, has created interest in lacquers of higher solids content and much work has been and is being done on the problem. A number of approaches are being used to overcome the objection that lacquers, because of their low solids, require multiple coats and, coat for coat, use more solvents than other types of materials. Low viscosity nitrocellulose formulations of tough and durable film characteristics are being actively investigated. High solvency combinations which give lower viscosities for a given solids content are being worked on. The use and technique of spraying hot lacquers, which decreases viscosity by means of increased temperature rather than increased solvent content, is being developed. High solids lacquers containing appreciable quantities of resins and having the speed of drying, hardness and toughness of conventional lacquers are being investigated. Finally, and in our estimation most important, water reducible lacquer emulsions of high solids content are receiving much attention.

We have read and heard from many sources that the emphasis on postwar finishes will be on speedy air drying or nearly air drying materials. If, as we believe, this is true, lacquers will perhaps be the most important finishing material to be used on the numberless items for which the market will be ready after the end of the war.

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NEWS FROM WASHINGTON—

By George W. Grupp

METAL FINISHING'S Washington Correspondent

Acetylene Black Under Allocation Acetylene black was placed under the control of Order M-300, Schedule 28, on July 1, 1944. The control, of course, will be eased to the extent that small orders of 25 pounds are exempt. Suppliers seeking authorization for delivery should make application on Form WPB-2947.

Alcohol from Rye Beginning July first manufacturers of industrial alcohol from grains have been directed to use rye to the extent of at least 10 per cent of their grain consumption. This action was taken by the WPB at the request of the War Food Administration which is seeking to have the alcohol production industry consume at least one million bushels of rye per month. This action was taken in spite of the fact that this will reduce the alcohol production.

Alcohol Requirements Increasing It was learned at the June 8, 1944 meeting of the WPB's Industrial Alcohol Producers Industry Advisory Committee that the production of 190 proof alcohol amounted to 192,200,000 gallons for the first four months of 1944 as compared with 137,400,000 gallons during the same period in 1943. Dr. Walter G. Whitman, assistant director of the Chemicals Bureau told the committee that the 190 proof alcohol requirements for 1944 will be 633,400,000 gallons as compared with 427,600,000 gallons in 1943 and with 229,200,000 gallons in 1942.

Aluminum Paint Order Amended The Aluminum Pigment and aluminum composition Supplementary Order M-1-g was amended on May 27, 1944. The amended order permits "coating the exterior and interior of new cans and jar closures, if made of black plate or chemically treated steel." It also provides that "an individual acting in his private capacity and not engaged in work for which he is compensated, may use for his own needs any aluminum paint or aluminum composition."

Sub-Grade Aluminum Pigment Raw Materials Eased The Aluminum and Magnesium Division of the WPB announced on May 26, 1944 that limited amounts of low grade "feed materials" would be released for the manufacture of sub-grade aluminum pigment for unrestricted or partially restricted uses. It was suggested that manufacturers and distributors of aluminum pigments should consult with their usual sources of supply concerning the availability of such "feed materials."

India's Baisaki Lac Crop in 1944 Nearly Doubled According to the latest available report of the Indian Lac Cess Committee the Baisaki lac crop of India for 1944 is expected to yield 719,250 maunds, (1 maund equals 82.28 pounds). The 1943 yield totaled only 372,000 maunds.

Chemical and Organic Pigments Committee Discusses Current Situation The production of acetoacetanilide, (which is used in the manufacture of organic yellow pigments), will be at the rate of 80,000 pounds a month by July as compared with the rate of 60,000 pounds during the earlier part of the year. It was also revealed at the WPB's Chemical and Organic Pigments Industry Advisory Committee meeting on May 25, 1944 that paratoluidine, (which is used in the making of red and yellow pigments), is being produced at the rate of 230,000 pounds a month. The committee was informed that an allocation order was being prepared because of the current shortage of barium chloride. No improvement during the next three months is expected in the bichromate situation. The production of betanaphthol seems to be ample to meet current allocations. The chrome pigments Order M-370 will be soon amended for clarification purposes.

Chemicals Transferred to New Allocation Orders Hexahydric alcohols, toluene, benzene, and certain types of xylene, formerly controlled under Orders M-270, M-34, M-137, and M-150 respectively, have been transferred to General Allocation Order M-300 to simplify paper work. Hi-finish naphtha, used in the production of paints, varnisnes and lacquers has been transferred from M-150 to Miscellaneous Chemicals Order M-340.

Conserve Alkyed Resins To conserve alkyed resins because of the critical shortage of phthalic anhydride, the WPB warned on May 25, 1944 that it is necessary to make further savings in the use of these resins for marine paints.

Linseed Exports of Argentina Drop It is officially reported that the shipments of linseed from Argentina to Europe during the first quarter of 1944 totaled 61,000 tons,—a drop of about 37 per cent when compared with the same period in 1943.

Paint Raw Materials Continue Tight Because of the shortage of raw materials it is necessary to continue careful allocation of lead-free zinc oxide, titanium dioxide, chrome pigments, cuprous oxide, practically all synthetic resins and their solvents, and hard drying oils.

Phthalic Anhydride Production must be Increased Due to the critical shortage of phthalic anhydride the WPB has asked the industry to step-up its annual capacity by 12,000,000 pounds. To conserve phthalate anhydride the industry is expected to do some research work to reduce the percentage of phthalic anhydride in alkyd resins.

Phythalic Anhydride Restrictions Tightened Directive No. 2 to General Preference Order M-139 was issued on June 1, 1944 to limit the maximum quantity of phthalic anhydride which may be used to meet the needs of the selected list of specifications issued by the Army, Maritime Commission, Navy, and War Shipping Administration. At the same time the WPB revoked all authorization for the use of phthalic anhydride resins issued prior to April 1, 1944.

Phenolic Resin Restrictions Eased The War Production Board announced on June 16, 1944 that a limited supply of phenolic resins will now be available for civilian uses. The decrease in military requirements has made it possible to relax restrictions on phenolic resin protective coatings.

Protective Coating Raw Material Allocation Procedure At a recent meeting of the Paint, Varnish and Lacquer Advisory Committee of the WPB the committee approved a uniform procedure of allocating raw materials for protective coatings. At this meeting WPB officials told the committee that a limited supply of alkyed resins will be available for highly restricted civilian uses, such as can enamels and insulating varnishes. Some tightening of lithipone is expected; very little change in the white pigment situation is foreseen; and the situation as it concerns titanium pigments for civilian uses is unchanged.

Protective Coating Solvents Eased Protective Coatings Branch of the Chemicals Bureau of the WPB announced on June 3, 1944 that due to an improved supply of normal butyl alcohol, normal butyl acetate, secondary butyl alcohol and ethyl acetate it plans to allocate limited quantities of the solvents for nitro-cellulose lacquer and thinner only for civilian uses. Applications should be made on form WPB-2945.

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But this finish can take it all . . . salt water, ethyl alcohol, high octane gas, lubricating oils etc. Air-dried in less than an hour, this finish was tested for over 300° F. by American Export Airlines. (Actually it can stand much more.) After it was sprayed on the various metals of the engines . . . aluminum alloys, steel, magnesium and copper . . . the engines were put back into service and the finish came through with a perfect score.

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LACQUER & CHEMICAL CORPORATION — 222 FORTIETH ST., BROOKLYN 32, N.Y.

Finishing Soldiers' Helmets

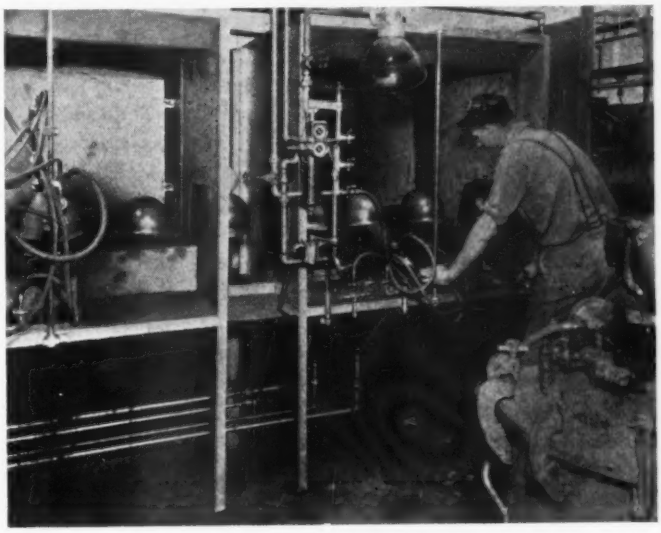
By FRANK V. FAULHABER

Brooklyn, N. Y.

PART I

A SOLDIER'S helmet represents a very important part of his equipment and, as with all supplies intended for our fighting forces, must meet certain specifications. Although the finishing of helmets in many respects is similar to the finishing of a number of items used for peacetime purposes, the product is intended to protect a vulnerable part of the soldier's anatomy and, therefore, must undergo exacting tests before being acceptable.

Although the new steel helmets are slightly heavier than the 1917 model, the soldiers don't seem to mind the extra weight at all. A soldier's helmet finds many uses apart from those for which it was developed by the United States Army. It is said to make a good seat just outside the pup tent—a sort of a front porch. It makes a convenient container for the various items a soldier takes out of his pockets before going to sleep. It can be used for taking baths. Moreover, it is the finest outdoor washtub ever manufactured, being roomy enough for at least two shirts and a couple of pairs of socks. In an emergency some of our resourceful soldiers have also found their helmets handy for cooking purposes.



Spraying soldiers' helmets

There is extensive production of soldiers' helmets by civilian contractors. For the finishing or coating operation many are using spray equipment, both manually operated and automatic. While the finishing procedures described in this article apply to no specific plant, they represent the general methods followed for the finishing of soldiers' helmets. The Rock Island Arsenal of Illinois, of which the commanding General, among others, furnished the writer helpful and authentic data for this article, conducted the research on this matter.

After the helmet bodies have been assembled and have undergone ballistic tests, they are ready for painting which must be undertaken as follows:

The color shall be olive drab and shall conform with a sample furnished or approved by the contracting officer.

The paint finish shall be hard, durable and non-cracking, as determined by test of panels. This test employs three panels, representing 8 hours' production and especially prepared to test the quality of the painting. It is necessary that the panels be made of the same material and painted in the same manner as the bodies they represent. One panel shall be prepared at the beginning, one at the middle and one at the end of each run. These painted specimens must be dry before testing. The painted test panels when bent 90° over a 1/8-inch radius shall not show any flaking of the paint or cracks on the outside of the bend. Failure of any test panel shall be cause for rejection of the batch of paint under test and all components painted with that particular batch.

Helmets to be painted shall be free from scale, rust, grease or dirt. (Note: A slight sandblast has proved very satisfactory for this operation.)

Spray the interior of the helmet body with one coat of lustreless olive drab synthetic enamel, in accordance with specification ES-No. 474.

Spray the exterior of the helmet with one coat of lustreless olive drab synthetic enamel, in accordance with specification ES-No. 474, mixed with not less than 8 ounces of ground cork per gallon of enamel.

Where thinner is required, this must be in accordance with Specification ES-No. 370 and shall in no case exceed 15 percent by volume of the enamel.

The cork should be kept mixed in a tank by means of a power driven agitator while the spraying operation is being performed. The material in the mixing tank should be under an air pressure of 8 pounds per square inch and the air pressure on the spray gun should be 15 pounds per square inch.

Note: The manufacturer or helmet finisher may use other material or procedure to obtain the finish specified, provided written approval of the contracting officer is first obtained.

Stencil Paint

The stencil paint used on helmets must dry to a flat surface and produce an elastic, light-fast and weather-fast film. This stencil paint shall consist of:

	Percent
Pigment	48-52
Liquid, containing at least 70% spar varnish	48-52
Pigment shall be composed of:	
Bone Black	50
Calcium carbonate	50

Inspection

Inspection and tests, unless otherwise specified, will be made at the manufacturer's plant. It is necessary that the contractor furnish the inspector, without expense to the government, such facilities, including suitable office space and furniture, as may be necessary for the performance of this work.

It should be borne in mind that the inspector and his assistants must have free access at all times to all parts of the helmet manufacturer's plant which concern the manufacture of the material under order. Furthermore, the inspection of the material purchased by the contractor may, at the option of the government, be at the works of the subcontractor, to whom all the provisions of its specification, not in their nature inapplicable, shall apply. Nothing contained in the government's specification shall operate to relieve the contractor of his responsibility for furnishing material conforming strictly with the requirements of the contract, drawing and specifications.

The inspector may decide on the provisional acceptability of all manufactured material to be used by the contractor for the work covered by his order but such acceptance shall not operate to transfer title to the United States and shall not preclude subsequent rejection for discovered or developed defects. In addition, the inspector shall promptly notify the contractor or subcontractor of the existence of any defect which in his opinion will probably make the material unsuitable.

"Lots" and Symbols

A "lot" of sheets shall consist of all sheets with the same heat number or symbol in a shipment. As applied to helmet bodies, a "lot" shall consist of all bodies formed from the sheets with the same heat number or symbol in a shipment.

It is required that a sample for government analysis shall be obtained from each lot of sheets bearing the same heat number or symbol. Further, equal portions of finely divided materials must be taken from at least four sheets or trimmings from bodies selected by the inspector and shall be combined and thoroughly mixed. The inspector must then forward for analysis not less than 5 ounces of the resultant mixture.

Another significant requirement on this helmet work pertains to bending tests on trimmings. These bending tests must be made on the trimmings from both edges of one sheet of each 250 sheets used for the bodies, except that in no case shall less than three sheets represent a lot. These specimens must be bent by pressure and must not be hammered. Failure of any bend test specimens shall be cause for retest of not less than twice the number of specimens that failed, selected by the inspector from the same lot. Failure of any specimen in the retest shall be cause for rejection of the lot.

Sandblasting

As an aid to obtaining a surface suitable for painting, a slight sandblasting may be used. Even the most superior paint materials cannot easily hide a rough or uneven surface. Sandblasting is one of the most effective methods of removing rust and scale and it enables the paint to obtain the proper hold on the surface of the metal. This make for better adhesion and longer life of the coating. If any traces of rust or scale remain on the metal surface, corrosion may develop under the paint film, since rust and scale absorb and retain moisture.

There are a number of factors having bearing on the quality of a sandblasting operation. A few are: (1) the condition and the type of metal surface, (2) the air pressure used, (3) the kind and grade of abrasive employed, (4) the rate of applying the sand or abrasive (governed partly by the nozzle size), (5) the manner in which the spray of abrasive is applied to the work, or the nozzle-to-work distance and angle, (6) the thoroughness with which the operation is done, (7) the type of sandblasting equipment in use, (8) the efficiency and condition of the sandblasting equipment.

Ordinarily a sandblasting unit includes equipment for reconditioning the used sand or abrasive. The used sand may be conveyed to a supply tank and used over again. Fresh sand may be added or the used sand may be discarded. Reconditioning the used sand is important in the modern finishing plant. At one time it was assumed adequate to remove any material too large to easily enter the nozzle by a simple screening procedure. However, it developed that it is just as essential to remove the extremely fine material, such as disintegrated abrasive and dust, whenever the effectiveness of the particular sandblasting operation was detrimentally affected. Consequently, so far as the blasting operation is concerned, it is desirable that the equipment be provided with the proper means for reconditioning the used sand.

Sandblasting cabinets are constructed in a range of styles for every possible type of work. Incidentally, for plants where it is necessary to clean a wide variety of shapes and sizes of articles and where production may be limited, a small hand cabinet may prove satisfactory. Such a cabinet consists of a simple metal case, equipped with an observation screen and two arm holes. The workman, wearing suitable heavy gloves, picks up the unit to be sanded and holds it under the stationary nozzle. By means of the observation screen he can observe the progress of the operation and turn the piece so that the blast will remove all objectionable scale or rust.

Where the product is normally of a light or fine nature, a turntable type of cabinet may be more appropriate. This functions on the turntable principle. The workman guides the hose through a slot in the side of the cabinet, noting the blast through an observation screen. On such a sandblasting unit the operator works outside, away from the dust and active abrasive.

Typical Sandblasting Unit

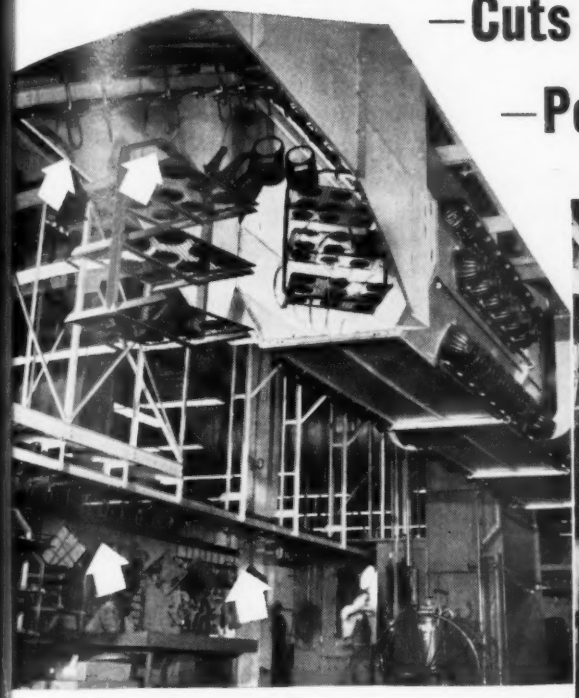
A typical unit suitable for the sandblasting of helmets is made of heavy gauge sheet steel welded together, so that it is dust tight and may be vented outdoors or to a dust collector. In this cabinet there is an electric light fixture which illuminates its interior. There is also a vision glass so that the operator can observe the sandblasting operation.

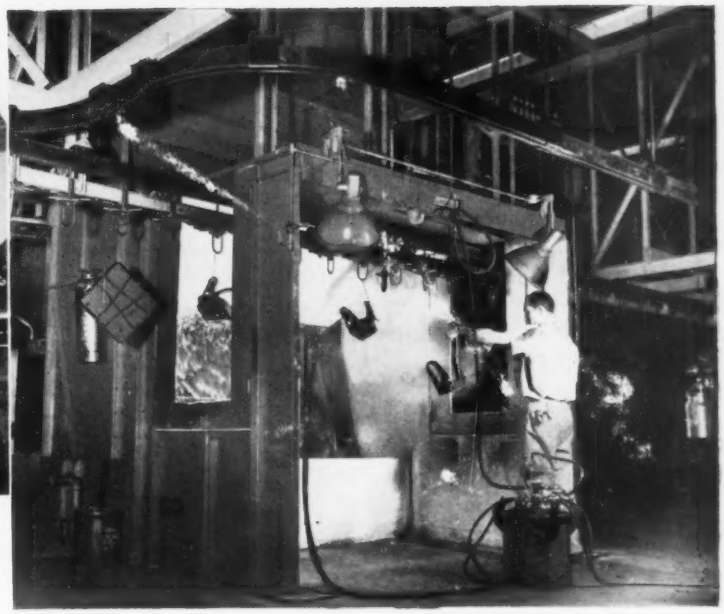
On this unit the operator can use both hands to hold the work. Arm cuffs are provided to seal the two openings against leakage of dust. When desired, rubber gloves can

PLANNED CONVEYING

—Cuts Work Travel

—Permits Processing in Transit





In designing new plants or converting existing ones, control of work flow is a key objective. Here, planning can pay dividends to the engineer who makes the right decisions on conveyors and their location as related to plant operations. Manpower loads are lightened, savings in time and space effected, when the right material handling equipment becomes an essential link in a chain of processes.

A case history example of planned conveying is the new Long Island plant of a well-known maker of precision instrument parts. Its finishing department, shown above, is located for a minimum of work travel. Its Gifford-Wood Overhead Conveyor System permits continuous processing of units in transit, saving production time and floor space. (See picture at right.)

GIFFORD-WOOD OFFERS ADVISORY SERVICE AS WELL AS CONVEYOR SYSTEMS

In the plant shown above, and in others in a wide range of industries, Gifford-Wood engineers worked with the factory engineers and designers in making material handling equipment part of the original plans. As a result, greater production per worker is achieved.

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be supplied, attached to the front arm opening in the cabinet to protect the hands. Nozzles can be furnished which will operate with pressures of from 5 pounds to 100 pounds. The amount of pressure, of course, depends upon the type of work and the speed of production. Any abrasive such as sand, flint or steel grit, can be employed. The flow of the abrasive can be adjusted at the mixer cup where it can be readily observed. On this unit, starting and stopping of the blast action is controlled by a foot treadle which turns the compressed air on and off. This particular type of sandblasting cabinet requires from 7 to 150 cubic feet of compressed air per minute to operate, depending upon the speed of production required. If the finishing plant is without compressed air equipment, a motor driven air compressor to operate the sandblast is used. On this unit the sand in the lower compartment may be changed from fine to coarse, or any degree in between, in a few minutes.

This particular sandblasting cabinet is available in different styles and can be used for all classes of work, regardless of shape or size, and is especially suitable for the cleaning of helmets.

Preparatory Cleaning

Proper cleaning of the helmets simplifies the entire painting operation and insures a more uniform and a durable product Many times paints fail because some detail prior to coating has been overlooked or neglected. Naturally, the more attention given to the cleaning of the helmets, up to the very point of the paint application, the mo satisfactory will be the final finish.

The writer has been informed that phosphoric acid pic ling of the helmets is in use by some manufacturers but treatment of the metal surface is required by present spec cations. Such phosphoric acid pickling, apart from other advantages, prepares the metal surface more suitab for proper adhesion of the paint.

Even after a successful sandblasting operation, unsati factory paint adhesion may result. This is particularly if the helmets are not painted immediately after bei sandblasted. If, through atmospheric or other condition the metal to be coated retains the slightest traces of moi ture, the painting of some of the helmets is sure to be fault During handling of the helmets, directly after their san blasting, perspiration may remain on the helmets, and th is certain to undo much otherwise good work.

Hence, the phosphoric acid pickling process can play n small part in finishing soldiers' helmets. As far as th operation pertains to the cleaning of helmets, the preceding sandblasting will have performed the major cleaning of th product, such as removal of oxide scale or rust, grease, oil etc. Its chief action is to inhibit any traces of rust th have formed or may be forming since the sandblast oper ation. The added chemical treatment of the helmets serv to support the work of the sandblasting, insuring a tight bond of the paint to the helmet.

Pickling Advantages

Even with quality paints used according to governme specifications, a good phosphoric acid pickling helps t produce longer life of paint coatings. In finishing helmets a few minutes' immersion in a phosphoric acid pickli solution at approximately 180° F. will serve. This can i done in still tanks where production is small. Larger plant with greater, steadier output may use a continuous pickli and rinsing unit.

In preparing a phosphoric acid pickling solution, th manufacturer's recommendations should be followed. Th proper temperature should be maintained and, therefore, thermometer should be used. Where high strength, hig temperature solutions are employed, it is desirable to exe cise closer control to insure satisfactorily pickled helmet and to prevent waste of acid and metal.

During the pickling operation, the acid strength and iron content should be checked periodically by using the equip ment for this purpose. Hydrometers are available for de termining the strength of fresh solutions. By maintaining close and accurate check on the process, a better product is sure to result, along with savings in materials and ef forts.

Rinse tanks should have a steady supply of fresh, clean water and an overflow in order that the helmets receive an adequate rinsing. A check should be made of each load or batch, not only to maintain correct operating procedures but also to coordinate the pickling of the helmets with the succeeding coating operation. Neutralizing tanks should be kept clean and care exercised to maintain solutions to correct standard.

(To be concluded)

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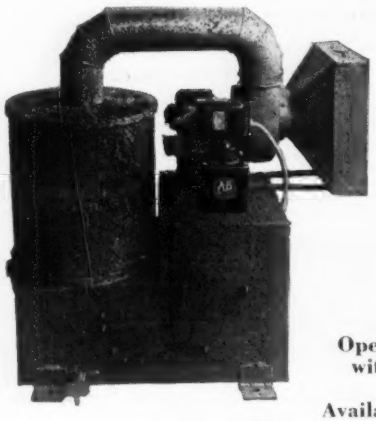

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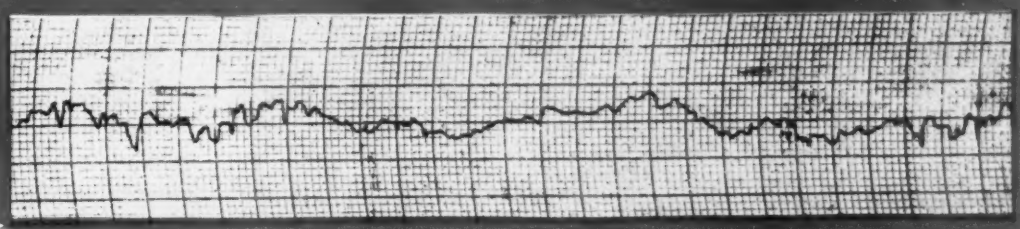

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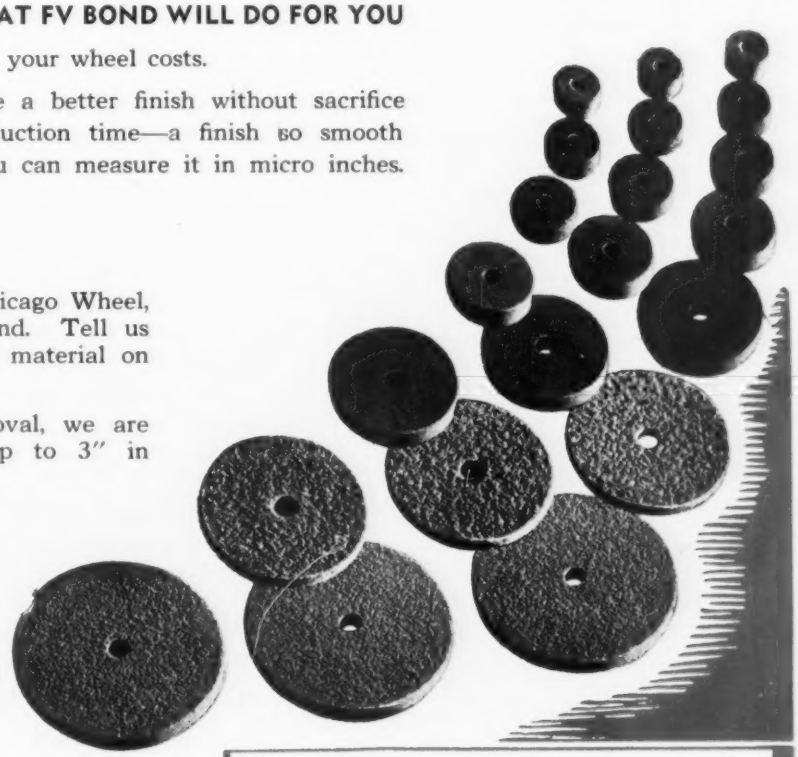

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Conveying and Baking Systems for the Finishing Industry

By C. A. LITZLER

Chief Engineer, Industrial Oven Engineering Co., Cleveland, Ohio

SINCE the beginning of modern manufacturing, the problem of finishing has been a prominent one in the minds of plant engineers and others responsible for product design and appearance. Years ago this problem was handled in a somewhat haphazard manner. Little attention was paid to the relation between the various finishing operations. Naturally, the final results often lacked appearance appeal and in many instances the finishing costs were exceptionally high.

Gradually, and over a long period, research on the part of finish manufacturers reduced drying times from hours to minutes and improved lustre, surface hardness and other characteristics. Spray equipment manufacturers developed automatic spraying equipment which greatly reduced attendant labor. Concurrent with these developments, industrial oven engineers and manufacturers also did their own research and development and began evolving original thoughts on product finishing. Naturally, all of these advances, although they were carried on independently, have produced the common result of reduced finishing costs and very decided improvements in product finishes. This is true whether the articles are metal furniture, washing machines, automobile bodies, or kitchen cabinets, machine tools, etc.

From all of these advances certain definite fundamentals have been established.

In the overall consideration of any finishing procedure, the first problem is the finishing material. Should it be enamel, lacquer or japan? Should one or two or three coats be applied? In this connection, finishing material manufacturers can be of great assistance. Their laboratories are available for experimental work to determine the answers to these problems.

Continuous overhead crossbar conveyor for automatic degreasing, dipping, baking and cooling.

The next major question is how the finishing material is to be applied to the product. Should the material be sprayed, roller coated, centrifuged, dipped, or flow coated? Some products by their very nature can be dipped, while others are sprayed to best advantage. Sometimes undercoats can be dipped and the final coat sprayed. Here again, equipment manufacturers are very willing to assist product designers. Usually this question ties directly into the next important consideration. That consideration is how the material is to be handled and baked—the subject of this discussion. It deals with a general consideration of the types of heating media that are available, as well as a description of the more common designs of finishing ovens and the related handling systems. This phase of the finishing problem requires the best of equipment. An illogical choice of equipment may be the difference between manufacturing profit or loss.

Basically, any oven system consists of a means of handling the work, a suitable insulated enclosure, and a heat source. In an efficiently engineered industrial convection oven installation, the component parts assume that position of relative importance. Usually the problem begins with handling the product. The oven type is dictated by the handling system. Finally, the heating medium and overall design are determined by the conditions on the location.

Overhead Conveyors

One of the basic types of handling systems often employed in finishing systems is the overhead conveyor. Variations include overhead monorail types, overhead crossbar types, and overhead hand push monorail types, all of which are very suitable for work that can be conveniently hung, or where a series of related operations can be tied directly into a completely continuous or semi-continuous operation.

Possibly the most common type of continuous overhead system is the overhead trolley conveyor. This normally consists of carrier trolleys riding on suitable I-beam or other cross section tracks. The trolleys are tied together by various types of conveying chains. The work in turn is hung directly from hooks on the chain or is carried in special hanging fixtures designed for a specific piece.

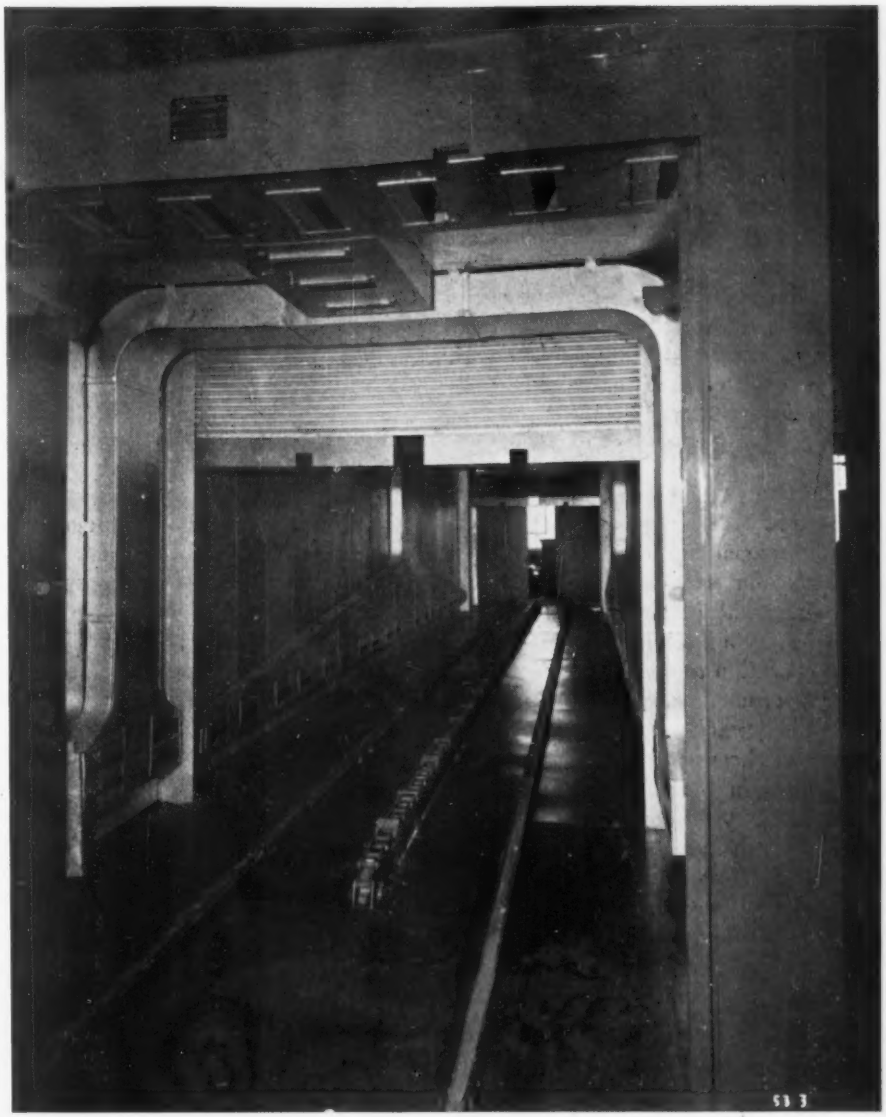
Such conveyors adapt themselves especially well to high production work where pieces are small, light, or of a shape that can be hung conveniently. Usually in a system of this type the work is left on the conveyor while washing, degreasing or spraying, since much time is lost in removing the work from the conveyor, processing it and then returning it to the conveyor hook for further processing.

These particular conveyors lend themselves to tunnel type oven construction, that is, an oven whose length is comparatively long in relation to its cross section. The A-type oven, which is usually elevated, also fits in excellently with this type of conveyor.

If a product can be sprayed on the conveyor or can be continuously degreased and then sprayed or dipped prior to baking, and if the production warrants it, trolley conveyor systems are very efficient. Likewise, if there are differences in elevation or if the related operations are scattered over some area, the use of overhead trolleys with power drive is almost a requirement when one considers the large possible labor savings. In most cases the labor saved allows the investment to be amortized in a very short period of time.

One of the conveyors that lends itself ideally to automatic degreasing or alkali washing, paint dipping, and finish baking is the overhead crossbar type. This type of conveyor consists of two parallel roller chains connected by pipe or similar cross bars at regular intervals. The work is hung by means of wire hooks directly on the cross bar. Such systems are very flexible and are useful when there are different elevations for different operations. They are, however, restricted to operation on the same center line.

Examples of products that can be used in this type of system are aircraft landing mats, lockers and metal furniture sections, filing cabinet drawers, metal shelfing, bundle lathe, or any product that has extreme width and length and relatively little thickness.



Floor type drag conveyor for intermittent operation.

If automatic dipping is carried on using a system of this type, proper attention must be paid to the speed of the conveyor in relation to the dip tank design, the draining time, and the viscosity of the paint. With most finishing materials rate of removal from the dip tank is an important consideration.

This type of conveyor and processing system is particularly suited for high production items where there are a group of operations such as degreasing or rust proofing, paint dipping, baking, and cooling.

Another style of overhead conveyor is the hand push trolley system where the work is either hung directly on a single trolley or where a number of pieces are carried on a rack and thence carried through the various processing units. Such a system might be classed as efficient for heavy objects which can be hung from a trolley or which can be placed on carriers or racks which in turn are supported by the trolley.

This system does not lend itself too well to automatic degreasing or finishing due to the fact that it normally does not present an inexpensive medium for degreasing or paint dipping to actually lower the work into the tank and raise it again to track level.

Where degreasing or paint dipping is required, suitable elevator sections can be provided so that a load of work can be pushed to the elevator section which lowers it into the tank, allows it to remain for the required length of time, and then raises it to the elevation

of the track. From this point the load is pushed by hand into the oven and then into a cooling zone.

A consideration in this type of system is the overall factor of operating costs, including labor, space, etc. Usually a system of this type requires considerable labor due to the fact that there can be no continuous unattended operations such as can be accomplished with the trolley or crossbar system.

Examples of the production that may be processed in this manner are large objects such as metal desks, large metal lockers, safes, etc.

Floor Conveyors

Normally, floor type conveyors are best used with very heavy work or with work that can be rack loaded. In such systems the work trucks or racks are provided with casters so that the work can be pushed around the plant from one operation to the next.

This type of system has been worked out for straight line operation with large and heavy work. After the work is loaded in the truck, the truck can be carried by the conveyor through the spray booth and then to a one-, two-, three-, or four-zone finishing oven.

In the use of floor conveyors, degreasing, automatic dipping, or spraying cannot be done, since the class and type of work usually does not lend itself well to fully continuous processing.

The design of a conveyor of this type is usually limited to straight line operations wherein the spray booths, dip tanks, ovens, etc., are located about the same center lines.

Examples of products that can be especially well handled by this type of system include large steel desks, metal lockers, automobile bodies, truck bodies, etc.

Travelling Hearth Conveyors

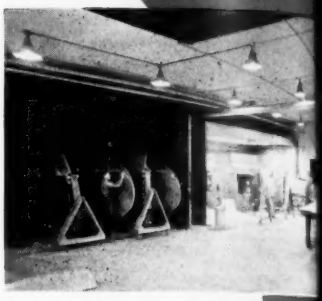
Another type of conveyor and oven system that is sometimes used for high production finishing is the wire mesh belt, or crossbar hearth type of conveyor. It consists of a travelling hearth upon which the freshly finished work is placed. Although this type of system lends itself more to heat treatment of bulk materials, it has a definite place in finishing small assemblies or parts. These parts may be tray loaded on the cross bar or hearth, or finished and laid directly on the mesh belt.

A particular advantage of this design is the fact that spray washing with either the alkaline solutions or plain hot water can be incorporated into the same conveyor and enclosure system.

The conveyors discussed above cover the more or less standard types of equipment available for materials handling. There are others but their uses are infrequent or related to specific processes or operations. Such types include electrode conveyors, lithographing conveyors, or festoon type oven conveyors for cloth, yarns, or other individual or small parts.

Within each of the types of conveyors discussed are a number of variables in design. Regardless of the system employed, the use of automatic conveyors in most cases has resulted in handling savings which usually

The Binks installation illustrated here is not only arranged for economy of space and ease of handling parts to be finished, but provides for a steady delivery of filtered air in a volume slightly greater than that removed from the room through the water curtains of the Dynaprecipitor water-wash spray booths. This eliminates dust from the department and results in a better control of finishes.



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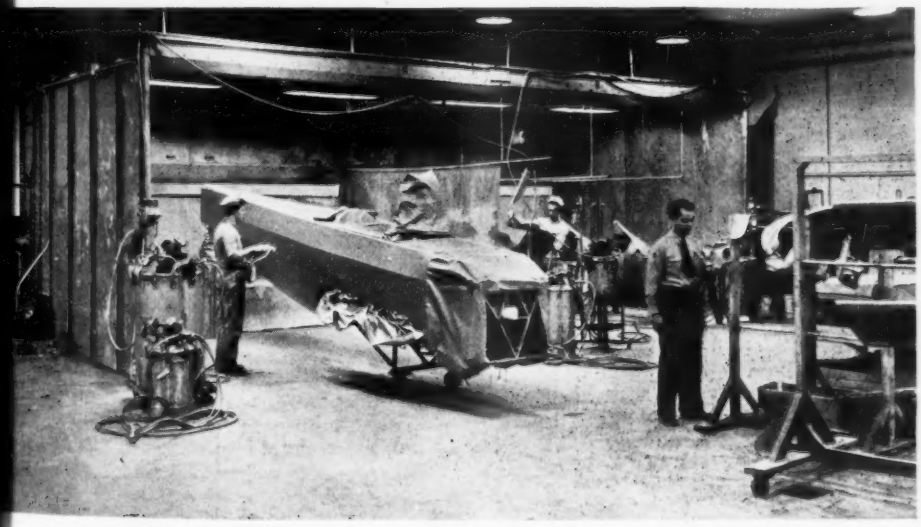
Binks installation speeds production

of Navy LIFE SAVERS

Speed, coordination, and safe, healthful working conditions are made possible by a Binks scientifically engineered spray painting system at the Howard Aircraft Corporation plant at St. Charles, Ill. Here Howard builds the fine, sturdy Navy ambulance plane which is known as the Howard Nightingale and which is equipped with first aid instruments and materials, two Stokes stretchers and an extra seat for the doctor or nurse.

Howard also builds the vitally important NH-1, which is the Navy's Blind Flying Instrument Trainer. It is flyable from three positions and is fully equipped with all the instruments necessary for training young Navy fliers in "blind flying." In appearance the two planes are almost identical — and in fact they are, except for the interior arrangements and outside color.

Below is pictured one of the booths for spraying fuselage sections in the Howard plant. The smaller pictures show the completeness of this Binks installation for spraying large and small parts of Howard planes.



equals the cost of the equipment in a very short time.

Sometimes in the consideration of an overall finishing problem it is found that automatic handling is not required. This is usually the case where the product is small, where the objects vary greatly as to size and shape, or where the individual processing is such that conveyor equipment is not required. In such instances, the work can be loaded on racks or trucks which are carried or pushed by hand between the various operations.

Oven Types

Let it be stated that the choice of oven type, especially in the larger systems, is a matter of balancing handling method, building location, finish requirements, and original investment. There are, however, several basic types of oven designs. We will discuss only basic oven types and not construction which usually is of secondary engineering importance in considering the problem of finishing a product.

Box Type Ovens

The most simple and elementary oven is the box type consisting of an insulated chamber, external heating system, and door openings built to accommodate a truck or rack upon which the work is placed. Ovens of this type require the least original investment, but they sometimes represent the most expensive installation in considering the overall finishing costs.

There are many box ovens in operation which are doing an excellent job of baking many types of products, but there are also many ovens of this type which do not contribute to the operating economies which should be earned from an efficient finishing system.

Double Compartment Ovens

The next most common type is the double compartment oven, which is two single compartment ovens built within the same oven shell. This oven will handle twice the production of the single compartment but there are inherent disadvantages. Sometimes a particular product requires finishing at different temperatures and the plant engineer visualizes the possibility of each compartment operating at a different temperature with a single heating system. Unless individual heating systems are provided, each compartment of a double compartment oven must be run at the same temperature. With the present type of convection equipment that is available, it is difficult to maintain the same air recirculation rates in each half of a double compartment oven without the installation of additional equipment to perform this function.

Multi-compartment Ovens

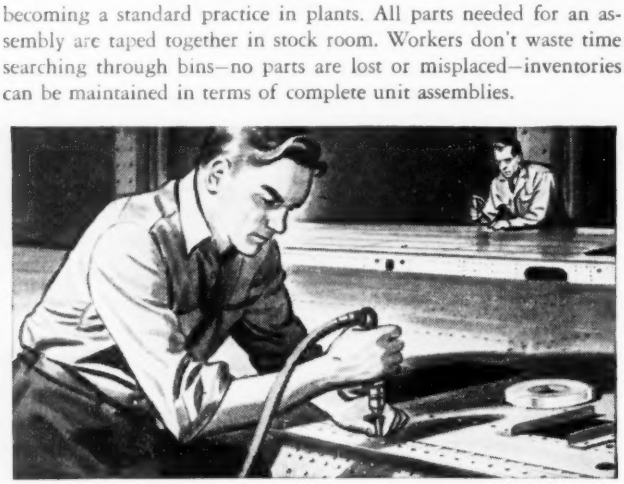
The next most common type of oven used in finishing operations is the multi-compartment type. The multi-compartment oven is usually a tunnel type in which there may be any number of separate alleys or work truck spaces side by side. Sometimes these installations become very involved, especially if the various alleys or compartments are operated at different

Do you know...?

Quiz on timely production short-cuts—No. 4

Q. Today unit assemblies often reach the man who assembles them:
☐ In separate boxes ☐ Piece by piece ☐ In bundles

A. In bundles. The unit assembly of parts with Permacel tape is fast becoming a standard practice in plants. All parts needed for an assembly are taped together in stock room. Workers don't waste time searching through bins—no parts are lost or misplaced—inventories can be maintained in terms of complete unit assemblies.

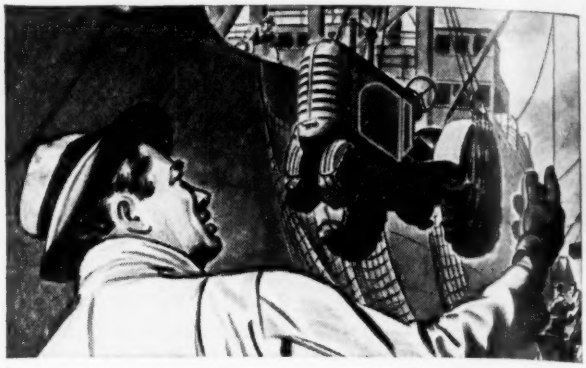


Q. Cold flush rivets are often held in place for air hammer by:
☐ Tongs ☐ Tape ☐ Glue

A. By Permacel's companion, Texcel cellophane tape, specially processed. This durable, quick-sticking tape holds rivets in position in aircraft assemblies while air hammer operator works down the line. Eliminates waiting, prevents nearby rivets from falling out because of vibration, speeds production, cuts costs.

Q. Tape was often used in pre-war compacts to:
☐ Keep compact closed ☐ Keep powder dry ☐ Hold mirror in

A. Hold mirror in place. Before the war, a special Permacel double-faced tape used for this purpose was found to be far superior to glue, which becomes brittle. After the war this tape will again be available for this and many other jobs—such as holding protective linings in bathtubs during installation.



Q. Biggest pre-war obstacle to shipping machinery overseas was:
☐ Corrosion ☐ High tariffs ☐ Shifting cargoes

A. Corrosion. But this is no longer true. Wartime experience in packaging tanks and planes for overseas shipment has proved that Permacel moisture-proof cloth tape (Utilitape) seals openings against outside moisture perfectly—helps eliminate the need for reconditioning plants abroad.

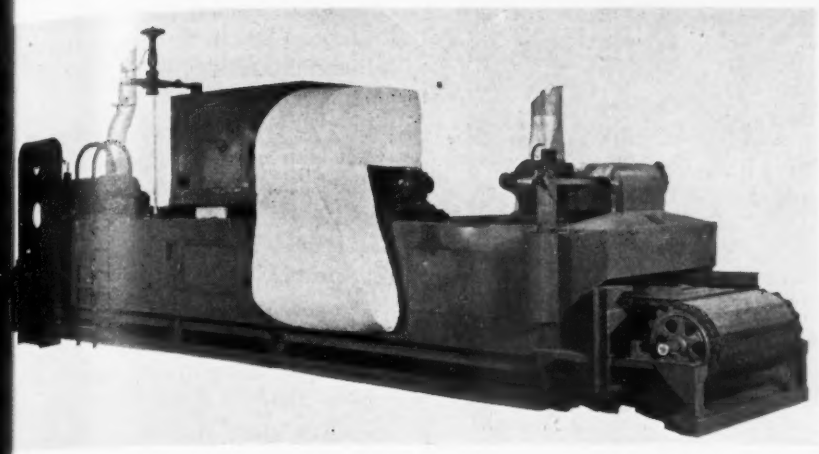
Q. Oxygen tent windows are sealed in order to:
☐ Keep bacteria out ☐ Prevent escape of oxygen
☐ Keep moisture in

A. To prevent escape of life-saving oxygen. Windows are often taped in with Permacel cloth tape (Jonflex) to help seal seams and joints—make it easy to remove and replace windows when tent is cleaned—eliminate tiny pinholes otherwise left by stitching.

Q. Which of these types of pressure-sensitive tapes can help speed and improve *your* production?
☐ Paper ☐ Cloth ☐ Cellophane ☐ Metal ☐ Glass

A. All of these types of Permacel tapes are today used in war production. Many war uses will prove helpful in your business when you return to post-war work. Meantime, our research laboratory facilities are available to you for development of special tapes to meet war or post-war needs.

Permacel
INDUSTRIAL TAPES
INDUSTRIAL TAPE CORPORATION
New Brunswick, N. J. Makers of Texcel Tape



Travelling hearth oven.

mperatures and if there is considerble length involved.

Although multi-compartment installtions are not too widely used in parts nishing, they do have some merit for rtain types of work.

A-type Ovens

Of the various types of ovens for aking organic finishes, possibly the ost commonly used is the A-type. ecause they can be used with pracically any type of overhead handling stem, a great number have been inalled.

One of the reasons that the A-type ven is particularly efficient from a eating standpoint is the fact that the xit and the entrance ends of the oven orm their own heat and air seal ithout the use of doors, air seals, etc. his is due to the ramps which form e ends of the oven and which act heat seals by being lower than the oor of the oven proper. In planning e design of an oven of this type, one ust consider the fact that it can be upported off the floor on its own tructure, it can be supported from the uilding roof, or it may be placed on e outside of the building roof with e conveyors entering and leaving the ven to suit the plant conditions.

Normally the entering ramp is used s the ventilating zone, and with some ypes of finishes the ventilating zone arries into the oven proper. The balnce of the oven is used for the baking one and normally very close temperture limits can be maintained.

A-type oven construction lends itelf particularly well to either the overead crossbar type conveyor or the verhead trolley conveyor, although pecial designs have been built to accommodate floor type drag conveyors utilizing ingenious methods for maintaining the work at a horizontal plane while going up the entrance ramp and down the exit ramp.

Tunnel-type Ovens

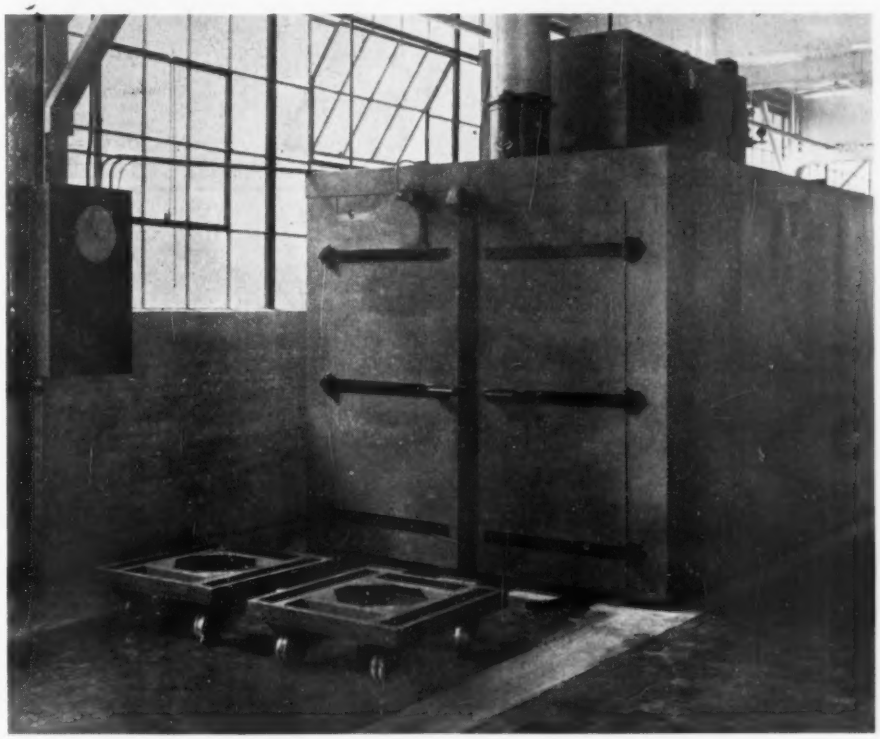
Certain conveyor designs and plant layouts dictate the use of tunnel type ovens. Tunnel type ovens, as the name implies, are relatively long in relation to their cross section, and as a rule they are entirely on one horizontal plane. The tunnel type oven lends itself exceedingly well to zone control or to partitioning the oven proper into preheating, baking, and cooling zones. Regardless of whether floor conveyors or overhead conveyors are used, zoning is efficiently accomplished by the use of motorized doors at the ends of the oven and to separate one zone from the other. Motorized doors are usually used with floor type conveyors of the intermittent type, where a given work truck operates from one zone to the next within the system. Time is allowed for the opening and closing of the doors between the zones.

From the above can be seen that there are many types of oven designs that may be used. Usually only one style does the job most economically and it is the proper function of the oven designer and engineer to determine this type.

Heating Equipment

After the decision is made as to the type of oven which will most efficiently process a given product, the next consideration is the type of heating equipment to be used to furnish heated air to the oven. This is usually dictated by actual conditions, that is, whether the fuel is to be gas, oil or electricity. The choice of fuel type depends on whether the heating system is to be direct or indirect.

An indirect type heating system is one in which the source of heat is separated from the air stream circulating within the oven. Products of combustion do not contact the work.



Single box type oven showing work trucks in foreground.

A CLEAN PART *for* A FRESH START

IN 60 SECONDS, sometimes less, sometimes as much as five minutes, Enthone Enamel Stripper de-coats baked synthetic enamels of the following types:

UREA-FORMALDEHYDE	RESYL
GLYCEROL-PHTHALATE	GLYPTAL
PHENOL-FORMALDEHYDE	MELAMINE

It's many times faster than the best type of caustic strippers.

A PRODUCT OF PIONEERING RESEARCH—first of its type to be synthesized, marketed and patented.* It is an emulsion, used diluted with water at room temperature or heated up to 180° F.

FAST ACTION—The action on the enamel is physical rather than chemical. First it contracts, then lifts and slips off without trace or blemish. No sign of pigment or solid residue is left on the work as in the case of caustics.

BASE METAL UNDEFILED—Enthone Stripper is mildly alkaline (pH 9-10) and does not attack steel, zinc, aluminum and magnesium or other metals. Anodized aluminum is unharmed and can be re-enameled without re-anodizing.

SIMPLE OPERATION—Work to be stripped is dipped in a tank containing the solution in the usual manner, mechanically or manually, and remains just long enough to remove the enamel. Then rinse in running water and dry. It is now ready for refinishing. Write today for FREE TRIAL SAMPLE.

THE ENTHONE CO.

446 Elm St. New Haven, 2, Connecticut

*U. S. Patent 2,242,106

ENTHONE ENAMEL STRIPPER

NO CAUSTIC ACTION

For SYNTHETIC ENAMELS . . . . . Urea-formaldehyde, Resyl, Glyptal, Glycerol-phthalate, Ph

FOR BRUSHING AND BUFFING SHEETS, PLATES AND SLABS

A Marschke Swing Frame Buffer is the most economical and convenient means for cleaning, brushing or buffing *LARGE AREAS* like sheets, plates and slabs. It is equally desirable for preparing *HEAVY WORK PIECES* or those too awkwardly shaped for one man to handle when working with a fixed wheel on a floor stand machine..

Lay the work-piece on a table or clamp it to a bench. Suspend a Marschke Swing Frame Buffer from a trolley on an overhead beam. It is so much easier to apply the maneuverable wheel of the balanced machine to the work than to lift such work to the wheel. It pays because it saves work and it does a good job too.

Send for Marschke Bulletin #47 giving detailed information about six sizes of Swing Frame Buffers for cleaning and polishing large areas and heavy work-pieces. Write to

MARSCHKE QUALITY GRINDERS AND BUFFERS

VONNEGUT MOULDER CORPORATION
1805 Madison Avenue
Indianapolis 2, Indiana

VONNEGUT MOULDER CORP. INDIANAPOLIS

This is usually done with indirect fired air heaters or, if the temperature requirements are low, with steam interchangers.

In a direct-fired heating system the heater is of the direct fired type wherein the actual products of combustion from the burning fuel are mixed with the air that is circulated through the oven proper.

The majority of finishing ovens now employed utilize the direct gas-fired system. Years ago many finishes that were available suffered deleterious effects if exposed to the products of combustion. Since then rapid advances have been made in finishes and oven design, and the products of combustion usually have no appreciable effect on painted surfaces. In most cases a properly designed direct gas fired installation will produce excellent work, even allowing for matching of colors processed in different batches and sometimes under different time and temperature conditions.

It is true, however, that there are certain finishes whose very nature does not allow products of combustion, even diluted, to contact them. In these cases, if the baking or polymerizing temperatures are low, the use of steam heat is indicated. Where temperatures are higher, there are several efficient indirect gas or oil fired heaters available with maximum outlet temperatures up to 1000° F.

As mentioned at the beginning of this discussion, the three major considerations are handling equipment, oven design, and heating equipment. Where full latitude is allowed the oven designer and if sufficient experience has been had in many finishing problems, the equipment will perform its function efficiently and, therefore, cheaply. Such minor considerations as type of temperature control, choice of safety equipment, duct design, etc., are problems which must be considered by the oven designer because they affect the overall operation of the system.

Regardless of how careful an oven itself is designed or regardless of how accurate the control, the system itself will not be economical if the handling method is incorrect. Likewise, the best handling system that could be conceived would not be efficient if the oven operations would not function closely or correctly.

One of a series of articles on the

preparation of metal surfaces for protective finishes

PRINCIPLES OF PICKLING

WHY INHIBITORS ARE ESSENTIAL

It is the purpose of this series of articles to sift among the unsystematized mass of facts and beliefs that have caused confusion in the pickling of steel, and disclose the facts that are essential to the efficient operation of the process and then present them in practical form to the pickling operator.

Pickling is defined as "the immersion of objects in dilute acid." Various kinds of acid, including sulphuric, hydrochloric, nitric, hydrofluoric, phosphoric and mixtures of these, may be employed according to the various requirements, but sulphuric is most suitable for most pickling.

How Scale Is Formed

The purpose of most pickling is to remove scale from steel. In working steel into required shapes, the preliminary operations are performed at high temperatures and in contact with air. Under these conditions the metal surface is oxidized into a layer of scale. The characteristics and composition of scale vary widely, depending on how hot and how long the metal was heated, and how the metal was processed while hot.

Pickling is also employed to remove from steel incrustations of rust, lime, or silica. Since pickling as a rule is carried out in exactly the same way no matter what type of coating or deposit is to be removed, the word "scale" will be used to include the above coatings also.

Why Scale Must Be Removed

Scale must be removed from steel in process of manufacture for, being hard and brittle, it causes excessive wear on the rolls and dies used in fabricating the metal. Also, unless the scale is removed from the metal prior to working it, fragments of scale become embedded in the metal, making it impossible to obtain a smooth metallic finish.

How Scale Is Removed

The most generally approved method for removing scale is pickling. Sulphuric acid, because of its low cost, is most widely used. Contrary to common belief, the sulphuric acid bath dissolves very little scale. Instead, the acid penetrates the minute fissures in the scale, and acts upon the intermediate bonding layers between the true metal and the true scale. These layers are dissolved rapidly, and the hydrogen evolved develops sufficient pressure to blast off large flakes of scale, exposing the true metal to the violent acid attack.

Hydrochloric (muriatic) acid, unlike sulphuric, actually dissolves large amounts of scale and, generally stated, produces a clean, bright finish free from "smut." Therefore, despite its higher cost, hydrochloric acid is coming into more general use where a clean, bright surface is desired. The selection of acid for any specific pickling operation depends largely on the determination of whether the advantages obtained from hydrochloric acid compensate for the higher cost.

Dangers of Pickling Without An Inhibitor

Steel has a composite crystalline structure and, since some of the crystals are more soluble than the others, when acid attacks the metal it does not do so uniformly but etches out the crystal pattern, thus causing roughening and pitting, sometimes so deep that the tensile strength of the steel is impaired.

Steel is an alloy of iron and carbon, but only the iron is dissolved by the pickling acid. The carbon remains on the surface as a black coating—("smut")—especially objectionable on wire where it may mask particles of hard scale and cause excessive wear on dies.

Rodine Solves Pickling Problems

For a long time the difficulties described were looked upon as necessary evils. The American Chemical Paint Company, however, refused to accept this philosophy and, as a result of scientific research, developed the selective control chemical, Rodine.

Rodine, effectively retards the action of the acid on the steel without retarding the removal of the mill scale or incrustations of rust, lime, salts, etc.

Rodine is an inhibitor which effectively controls acid in the pickling bath, confining its action to the removal of scale and rust and preventing the acid attack on clean metal.

Rodine Saves

Acid ..... prevents acid waste in dissolving good metal
Metal ..... minimizes metal loss
Rejections .. minimizes embrittlement, blistering and marred surfaces
Time ..... makes speed possible without danger of overpickling

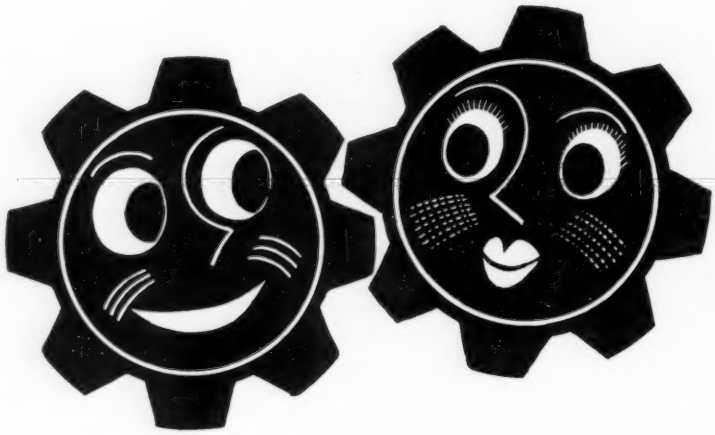
These are but a few of the many advantages of Rodine discussed in our Technical Service Data Sheets which we will be glad to send on request.

Manufacturers of Inhibitors & Metal Working Chemicals

AMERICAN CHEMICAL PAINT CO.
AMBLER ACP PENNA.

Note—West Coast Plants may address inquiries and orders for prompt delivery to Leon Finch, Ltd., 728 East 59th St., Los Angeles, California

AMERICAN CHEMICAL PAINT COMPANY, AMBLER, PA.
Please send me general Technical Service Data Sheets on
Name_____ Title_____
Company_____ ☐ *Rodine*
Address_____ C-7 5



Vital metal parts are being protected with JOHNSON'S Corrosion-Inhibiting Waxes!

Many manufacturers of metal parts for war use protect their products prior to and during assembly with Johnson's Corrosion-Inhibiting Wax.

These waxes provide a shop coating that inhibits corrosion. They provide a dry protective coating which is not easily removed by handling and not "soaked away" by contact with absorbent packing materials. They protect *all* metal surfaces, whether unfinished or plated . . . and particularly surfaces which have been black oxidized or chemically treated. In many cases, they also act as dry lubricants.

Other marked advantages . . . Johnson's Corrosion-Inhibiting Waxes are non-flammable and non-toxic. Fast drying, they have high coverage and are easily applied by spray or dip methods. No special equipment or skill is required. No heating or dilution necessary.

You might well have use in *your* plant for these wax coatings. It will cost you nothing to find out. Write for full information.

S. C. JOHNSON & SON, Inc.

Industrial Wax Division, Dept. MF74, Racine, Wisconsin

Canadian Address—Brantford, Ontario

MAKERS OF JOHNSON'S WAXES FOR INDUSTRY

★ *Buy MORE War Bonds!* ★

These and many more war materials are being protected with Johnson's Corrosion-Inhibiting Waxes!

- Machine gun parts
- Parts for planes, tanks, jeeps
- Aeronautical instruments
- Gun clips, gun parts
- Bayonets, machetes, rifle grenades
- Gun barrels
- Snaps and buckles for parachutes
- Harness snaps and rings
- Smoke canisters for chemical warfare
- Overseas water heaters
- Steel molds, cores, die blocks
- Nuts, bolts, washers, rivets
- Shovels, picks, axes
- Tools and wrenches of all types
- Micrometer heads and machine dials
- Cutting knives and meat saws
- Radio frequency coils

Tomorrow Johnson's Corrosion-Inhibiting Waxes will be available to protect and beautify your peacetime metal products. It will give your merchandise that "extra" feature to help it beat increased postwar competition.

New Equipment

Eye Shield

Pulmosan Safety Equipment Corp., Dept. OF, 176 Johnson St., Brooklyn, N. Y., has announced a new 1-1/8 oz. non-fogging eyeshield. This eyeshield named Secureye is said to offer protection from flying particles because of its high impact resistance and to eliminate overhead glare by means of its frosted visor. An exclusive feature is a seamless body which allows unrestricted 180° range of vision. Prescription glasses may be used under the Secureye shield.

Emulsion Paint Ingredients

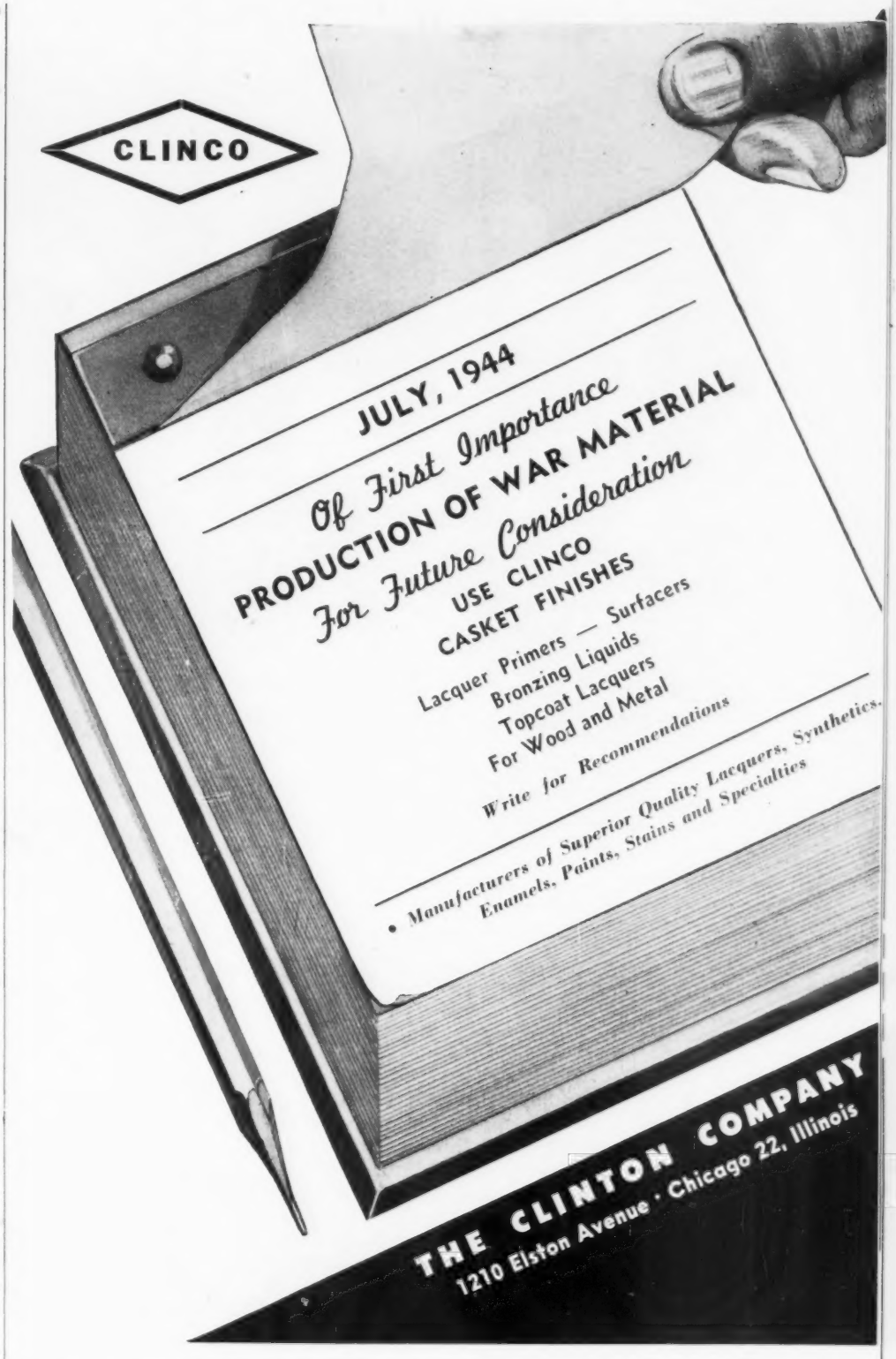
E. I. du Pont de Nemours and Co., Inc., Dept. OF, Wilmington, Del., in a recent news release, discusses the important roles placed by chemical undercover agents in water emulsion paints. Quoting from the release:

"There is a wartime consumer product that enjoys a phenomenal popularity because it is so simple for the homeowner to use with professional results—resin emulsion wall paint that thins with water.

"Such ease of use is achieved by a chemical complexity consisting of fifteen ingredients. These include, in the Du Pont resin emulsion formula, an anti-foaming agent, a wetting agent, a stabilizing agent, and an emulsifying agent. Though present in minute quantities, by chemical action the agents perform big jobs.

"Were it not for the anti-foam constitutent, tiny bubbles would form under the brush bristles leaving pits in the quick-drying film.

"As the housewife knows who has tried to mix cocoa in cold water, some dry substances simply cannot be stirred into a liquid. Because of the wetting agent however, no difficulty is encountered in thinning down, directly from the water tap, the resin emulsion paste, in which form this new type of finish reaches the householder.

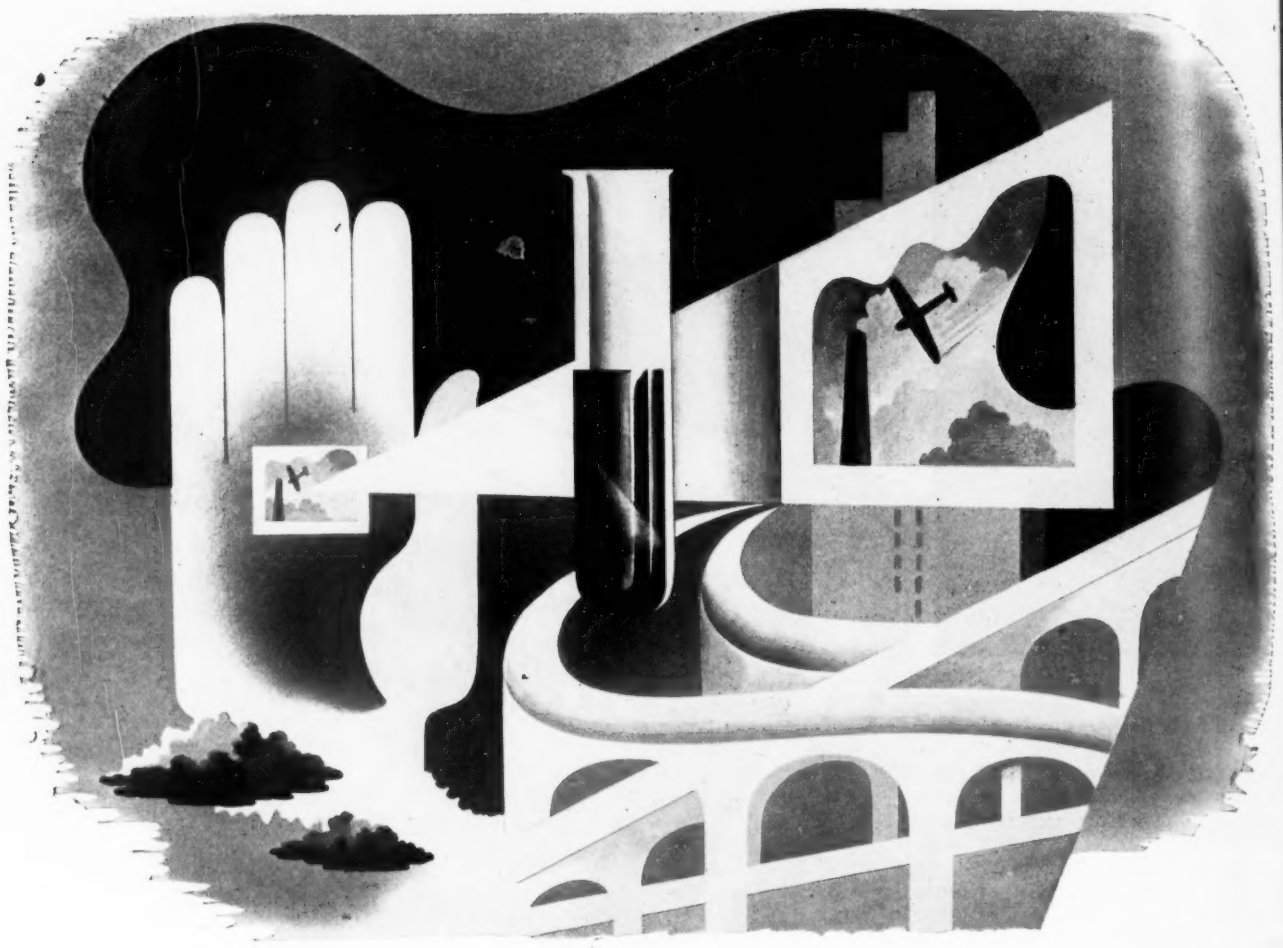


"The stabilizing agent preserves the emulsion so that it is in condition for use when it leaves the store shelf.

"The emulsifying chemical is the most important of the "undercover" agents, for without it the water-reduced protein paints could not exist. An emulsion is a suspension of one liquid in another liquid in which it is not soluble or with which it does not mix readily. In this case, the chemist has successfully mixed oil in water in order to combine the economy and quick-drying advantages of water paints with the resistance and washability of oil-type finishes. The emulsifying agent suspends droplets of oil in the water and prevents the two from separating into layers."

Insulating Varnish

The Sterling Varnish Company, Dept. OF, Ohio River Blvd., Haysville, Pa., has announced the development of R-851 which the manufacturer claims to be the most flexible insulating varnish ever offered to the



VISIONARY DREAMS

In test tubes fired by war, chemical research has laid the foundation for far-reaching prosperity. New products have been created, new bases developed, new techniques evolved which stagger the imagination . . . which translate today's dream into tomorrow's demand. How this research will affect your business, what it can do for your product, is obviously impossible to ascertain except by expert examination . . . and such examination should certainly be included in your post-war planning. Our staff of expert finishing engineers will be glad to cooperate with your organization. Your inquiry incurs no obligation. Address The Stanley Chemical Company . . . manufacturers of Stanley Lacquers, Synthetics, Enamels, and Japans . . . East Berlin, Connecticut.

Stanley Chemical

electrical industry. It is designed for applications that demand great lead wire flexibility in addition to high mechanical strength.

R-851 is said to show so little progressive hardening when the dried film is exposed to the air that it is further recommended for coating armature and stator coils that will be stored for long periods before assembly.

This clear baking varnish dries completely throughout when baked at a temperature of 135°C. and the dried insulation is oil proof and affords a protection that is exceptionally water, acid, and alkali resistant, according to the manufacturer. It is particularly recommended for electrical equipment wound with glass covered wire designed to operate at exceptionally high operating temperatures.

The company will be pleased to furnish more detailed information upon request.

Fire Extinguisher

Outstanding advancement in extinguishing industrial fires is the new "All-Out" Fire Extinguisher manufactured by the National Powder Extinguisher Corporation, Dept. OF, 50 Rockefeller Plaza, New York City. Designed especially to extinguish both flammable liquids and fires of electrical origin, the chemical ejects a stream of "All-Out"

Dry Chemical which, when activated by heat, forms a dense, fire-smothering cloud over a flaming area up to 18 feet. The insulating qualities of the cloud help guard against re-flash, and create a heat-deflecting screen between the operator and flame, permitting close range attack with greater safety and no heat discomfort. The chemical, a non-conductor of electricity, is harmless to humans and delicate, mechanized parts of motors or machinery.

Weighing only 37 lbs. fully charged, the "All-Out" extinguisher is easily manoeuvered by men or women workers. It is fast in action and can be quickly recharged at the scene of a fire without special recharging equipment. According to Charles A. Koons, president of the corporation, both the extinguisher and its extinguishing agent have been tested and approved by the Associated Factory Mutual Laboratories on burning oils, alcohol and gasoline fires.

Power Brush

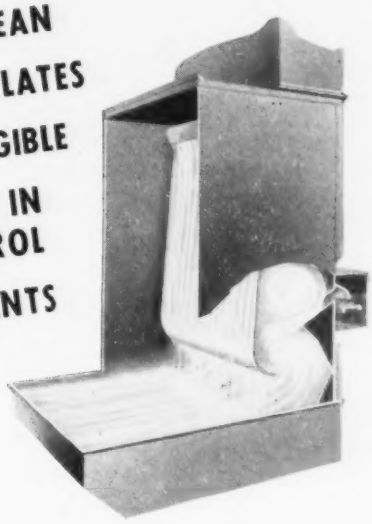
Power brushing, in the form of a portable tool driven, steel-bristled cup-shaped brush, is reported the only method possible by which the acres of steel surfaces on the 7-mile long San Francisco-Oakland Bay Bridge can be properly conditioned for the application of protective paint, a job that takes all the time of 15 to 20 men working year in and year out.

This power-brushing unit, with which each man is equipped, removes salt deposits and loose scale and paint from the steel surfaces prior to repainting. This method is at least ten times faster than hand surface preparation, according to The Osborn Manufacturing Co., Dept. OF, Cleveland, Ohio, producer of power brushes and suppliers of the particular brushes employed on the bridge.

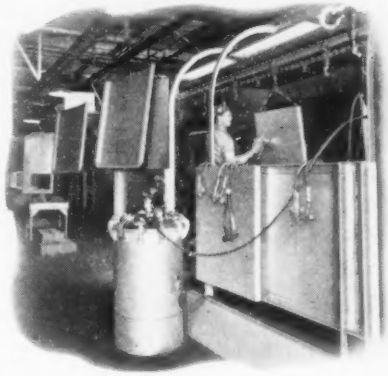
The brush is of cup shape, approximately 3¼ inches in diameter, heavily-filled with coarse, .020 S.A. wire, the wires extending 15/16-inch out of the cup. Operated in and driven by a portable hand tool, the brush spins at 4299 r.p.m.

Here's the Spray Booth for YOU!

- NO SPRAY NOZZLES TO CLEAN
- NO NESTED ELIMINATOR PLATES
- MAINTENANCE COSTS NEGLIGIBLE
- EXCEPTIONALLY EFFICIENT IN PAINT SPRAY CONTROL
- RECLAMATION OF PIGMENTS FACILITATED



A few of the many advantages brought you in Hydro-Whirl



THE Hydro-Whirl principle combines the proved advantages of wet precipitation with a radical departure from the conventional design, thus is ideally suited for the collection and safe handling of practically all finely divided, linty and adhesive industrial dusts. It also answers the problem of precipitating pigments from the overspray in paint spraying operations.

The same patented Hydro-Whirl principle of cleaning exhausted air used in Peters-Dalton Booths is also employed in our dust collectors.

HYDRO-WHIRL **PETERS-DALTON** *Incorporated*

624 EAST FOREST AVE. • DETROIT 1, MICH.
(Formerly Industrial Sheet Metal Works)

MFRS. HYDRO-WHIRL DUST COLLECTORS AND SPRAY BOOTHS—INDUSTRIAL OVENS, MECHANICAL WASHERS AND VENTILATING SYSTEMS

If You Use
...or Plan to Use
SOLVENT DEGREASERS

YOU'LL WANT A COPY OF
this **NEW BOOK**

Here is a clear, concise description of modern chlorinated degreasing methods which are used in every type of industrial cleaning operation. One section of this book covers in complete detail how solvent losses can be reduced to provide the greatest economy in metal cleaning.

If you haven't received your copy, write for it on your company letterhead. There's no charge or obligation.

DETREX CORPORATION
13009 HILLVIEW AVENUE • DETROIT 27, MICHIGAN

YOUR PURCHASE OF WAR BONDS
SAVES LIVES

Business Items

James W. McLaughlin

James W. McLaughlin is the new president of the *Bakelite Corporation*, a unit of Union Carbide and Carbon Corp. Mr. McLaughlin was granted the degree of Bachelor of Science in Mechnical Engineering by the University of Illinois in 1914. After a short experience as an engineer with Peoples Gas Light and Coke Co. in Chicago, he entered the employ of The Prest-O-Lite Company, Inc. He has been in charge of major production operations in the Industrial Gases and Chemicals companies of the Corporation continuously since that time. Mr. McLaughlin will direct all of the plastics operations of Units of the Corporation, including the Plastics Division of Carbide and Carbon Chemicals Corp.

The appointment of *Rex C. Hall* as sales manager of the Automotive Finishes Division has been announced by *C. M. Lemperly*, vice-president of *The Sherwin-Williams Co.*

Mr. Hall has been associated with The Sherwin-Williams Co. since 1937. In 1942 he enlisted in the Marine Corps and, after receiving a medical discharge in 1943, returned to the company as supervisor of Automotive and Graphic Arts at Oakland, Calif. for the Pacific Coast area.

Announcement has been made by *Dwight P. Joyce*, president of the *Glidden Co.*, that *Elmer L. Weber* has been appointed promotion manager of the Paint Division of the company.

The *James Bradford Co.*, paint manufacturing firm of Wilmington, Del., has been purchased by *Devoe and Raynolds Co., Inc.* The company will operate as *the James Bradford Co. Division of Devoe and Raynolds Co., Inc.* No change in headquarters or personnel will be made.

O. J. Leone has been appointed Pittsburgh Regional Manager of *Steel Mill Division* for *The Bristol Co.*, Waterbury 91, Conn., as announced by *H. E. Beane*, Sales Manager. Mr. Leone's duties in his new position will include special engineering work in connection with the application of the company's line of steel mill instruments.

O. J. Leone

The DeVilbiss Co., Toledo, Ohio, announces that four one-week sessions in the second half of its 1944 School of Spray Painting will be devoted to the instruction of industrial finishers. With finishing men in plants everywhere hard-pressed to meet the demands of wartime jobs and eager to learn faster methods, all sessions are expected to attract large enrollments.

A leading maker of spray painting equipment, DeVilbiss will admit free all regular users of its products. The same ground will be covered in sessions starting July 17, August 14, October 16, and November 13. DeVilbiss-trained spray painting experts will be in charge of classroom instruction and shop work.

To make sure of reservations, industrial finishers interested are urged to write at once to The DeVilbiss Company, Toledo 1, Ohio.

A course in industrial organic solvents, sponsored by the U. S. Office of Education, has been announced by the University of Southern California. *Richard B. Pollak*, chemist of The Sherwin-Williams Co. of California will instruct in the course which will cover testing, evaluation, analysis, formulation, etc. of thinners and solvents. One year of college chemistry or the equivalent in industrial experience is required.

Right:—J. A. Paasche presents watches to William Sharman, treasurer, George Rosgo, superintendent of the sheet metal shop, and Berg Halvorsen, foreman of the universal airbrush dept. in recognition of their 25 years of service with the Paasche Airbrush Co.

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METALPREP . . .

For metal cleaning, either by hand operation or semi-automatic cleaning systems.

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For preparing galvanized iron, galvanneal and other zinc-coated surfaces.

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Forms a paint-receptive rust-retarding phosphate coating on iron and steel surfaces.

PREPWASH . . .

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For removal of all types of scale. Non-fuming, con-corrosive on adjacent equipment.

Take warning against under-paint menaces. They give no sign of their presence until, suddenly, you are confronted with a costly re-finishing problem. That's why improved cleaners and cleaning methods are so essential to proper paint adhesion. That's why you should concentrate on Prep Products, the popular line that has proved its superior effectiveness in preparing metal for paint and assuring permanence of the finish.

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"Finishing Metal Products"
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By Dr. C. L. Mantell. $5.50

"Metal Coloring and Finishing"
By Hugo Krause. $5.00

"Metal Coloring"
By A. H. Hiorns. $2.40

"Protective Coatings for Metals"
By Burns & Schuh. $6.50

"Principles of Electroplating & Electroforming"
By Blum & Hogaboom. $4.50

"Modern Electroplating"
By Electrochemical Society. $5.50

Postage and Handling Charges 50c — Total $6.00

"Lacquer and Synthetic Enamel Finishes"
By Ray C. Martin. $5.50

Plating & Finishing Guidebook, 1941
$1.00

Plating & Finishing Guidebook, 1942
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Plating & Finishing Guidebook, 1943
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Manufacturers' Literature

Lithoform

Making Paint Stick to Galvanized Metal is the subject of an interesting technical service data sheet on Lithoform issued recently by the *American Chemical Paint Co.* For a free copy, write American Chemical Paint Co., Dept. OF, Ambler, Penna.

Finishing Systems

A series of four leaflets covering Metal Cleaning and Rustproofing Systems, Spray Booths, Drying and Baking Ovens, and Complete Finishing Systems has been issued by *The R. C. Mahon Co.*, Detroit, 11, Mich. Each leaflet is profusely illustrated with photographs of typical installations and describes the features of the particular type of equipment. The leaflets will be found interesting for the information contained in them.

Industrial Clothing

A catalog section on its recently introduced line of industrial clothing coated with rubber or rubberlike materials has just been published by *The B. F. Goodrich Company*, Dept OF, Akron, Ohio, and is now available upon request. Price lists on the line also are available.

The catalog section illustrates, and describes in detail the design and construction of B. F. Goodrich brand clothing including the fire coat, general purpose work coat, double back industrial coat, and standard police coat. Description is also made of the universal work pants and jacket, workers' leggings, work 'n weather hats, and aprons covered with a resin originally designed for laboratory use but now widely used in the mechanical and food industries.

Electronic Controllers

The Bristol Company, Dept. OF, Waterbury 91, Conn. announces a new bulletin No. B220 describing its new line of Free-Vane Electronic Controllers for automatically controlling temperature, pressure, liquid level, and humidity. The bulletin gives wiring diagrams, principle of operation and general description and features of the new instruments. Copies may be obtained by writing The Bristol Company.

Radiant Energy

An 8-page booklet devoted to infra-red ray radiant energy heating and drying has been issued by *North American Electric Lamp Co.*, 1014 Tyler St., St. Louis, Mo. The booklet discusses the nature of radiant energy and describes the advantages of infra-red for drying, heating and baking. A section of the booklet is devoted to an illustrated story of the production of infra-red ray carbon lamps manufactured by the company and descriptions of lamps, reflectors, strip units and portable units are given.

Patents

Paintbrush

U. S. Pat. 2,345,991. H. A. Rishel, April 1944. The combination with a paint brush ing bristles, a handle, and a ferrule for ding the bristles, of a sliding girdle unted to embrace and contact with the stles, and a wiper to prevent the spread paint to the handle by the sliding girdle.

Non-Gelling Bronzing Lacquer

U. S. Pat. 2,345,955. H. L. Wampner, signor to Commercial Solvents Corp., April 1944. A coating composition free from sic pigments and having reduced tenden- to liver or agglomerate, which comprises bronze powder, a film-forming agent select- from the group consisting of cellulose rate and an oil-modified alkyd resin and a t of malic acid selected from the group nsisting of 1-(hydroxymethyl) isopropyl- mmonium malate, 1-(hydroxymethyl) pro- lammonium malate, 1,1-bis(hydroxymeth- ethylammonium malate, 1,1-bis(hydroxy- thyl) propylammonium malate, and 1,1- (hydroxymethyl) ethylammonium acid alate.

Non-Gelling Bronzing Lacquer

U. S. Pat. 2,345,956. H. L. Wampner, signor to Commercial Solvents Corp., pril 4, 1944. A coating composition free om basic pigments, but having reduced ndency to liver or agglomerate, which com- ises a bronze powder, a film-forming agent lected from the group consisting of cellu- se esters and modified ester resins formed om polyhydric alcohols and polybasic acids, nd a neutral salt of malic acid of given uctural formula in which R is a member the class consisting of hydrogen, alkyl, yl, and furyl; R^1 is a member of the class nsisting of hydrogen, alkyl, and alphahy- roxyalkyl, and X is a member of the group nsisting of cycloalkylidene, alkyl-substi- uted cycloalkylidene, and wherein R^2 and represent members of the group consist- g of alkyl, aryl, and aralkyl.

Coated Object

U. S. Pat. 2,345,583. N. K. Chaney, as- gnor to The United Gas Improvement Co., pril 4, 1944. A formed film-coated article aped by deformation of a metallic body ated with dried resinous polymer of cyclo- ntadiene selected from the group consisting resinous polycyclopentadiene and resinous opolymer of cyclopentadiene and methyl clopentadiene in which copolymer the pro- rtion of methyl cyclopentadiene does not ceed 20%, said formed film adhering ten- iously to the formed metal.

Paint Remover

U. S. Pat. 2,346,622. L. V. Steck, as- gnor to Shell Development Co., April 11, 1944. A finish remover suitable for remov- ng dried coats of paint, varnish and lacquer ontaining major amounts of 2-chlorobu- ene-2, 1,2,3-trichlorobutane, and an aroma- ic hydrocarbon, and a minor amount of a lm-forming compound.

The IRCO-IZING PROCESS is

a chemical dip treatment for iron, steel, zinc and cadmium . . . providing a rust inhibiting base for paints or . . . a final finish.

LET US BE SURE!

The ammunition and tools we send the boys for the invasion reach them free of RUST and in PERFECT working condition. THERE MUST BE NO DUDS.

- The IRCO-IZING chemical is immediately available.
- The IRCO-IZING process meets all Government Specifications calling for Prosphate Coatings.
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Expert engineering service extended to our users. Write to the Department C-1 for further information.

INTERNATIONAL RUSTPROOF CORP.

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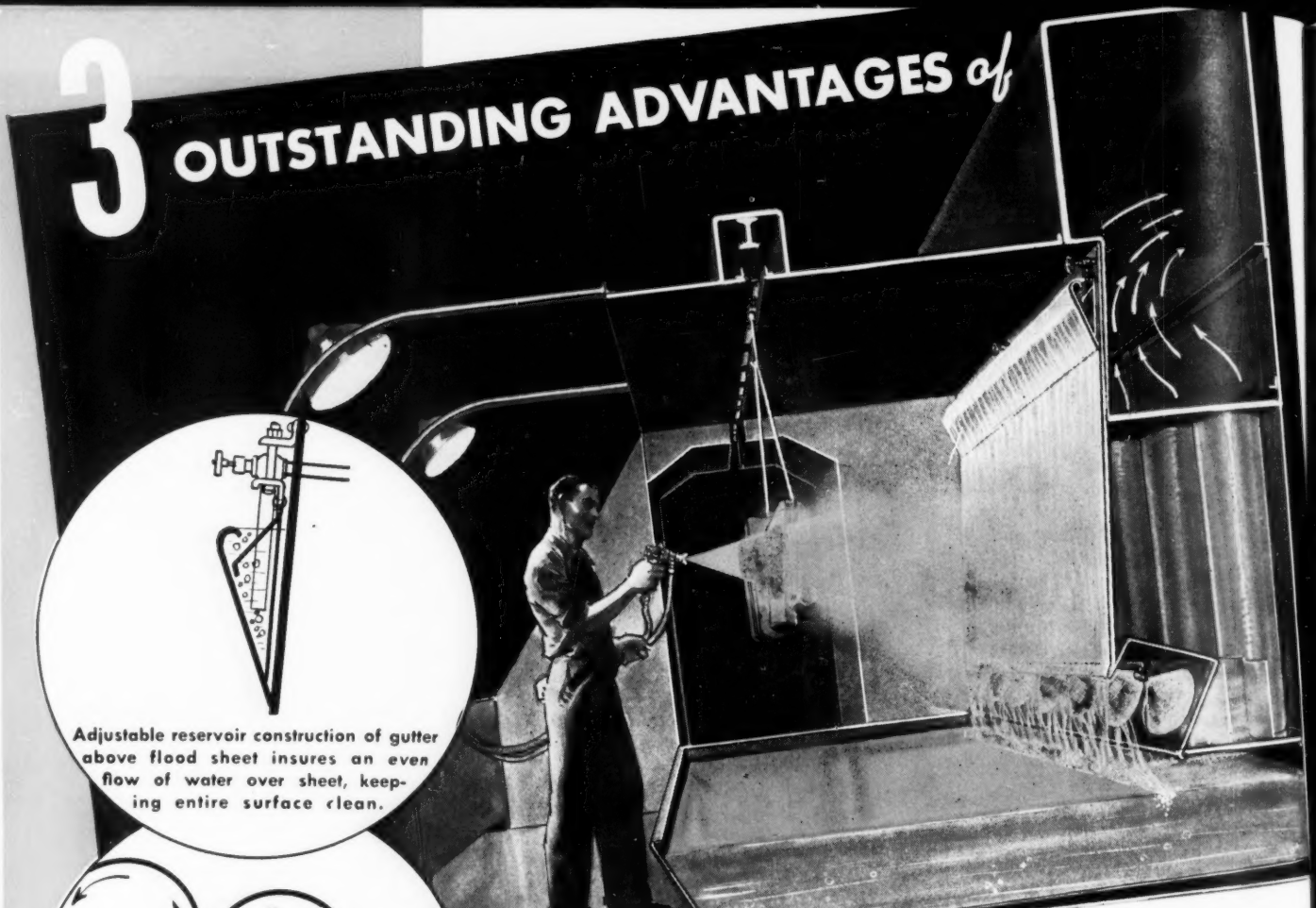
Thermoplastic Lacquer

U. S. Pat. 2,346,600. V. A. Navikas, assignor to Armstrong Cork Co., April 11, 1944. A thermoplastic lacquer comprising 3 to 9 parts by weight of an interpolymer of isobutyl methacrylate and n-butyl methacrylate, 1½ to 6 parts by weight of a coumarone-indene resin, ½ to 3 parts by weight of nitrocellulose, 1 to 5 parts by weight of a plasticizer which does not impart taste and odor, and a solvent, said ingredients being in such proportions that the composition, when baked at a temperature of about 200°F. to about 250°F., develops a film which is hard and nontacky at room temperatures and which becomes plastic and tacky when subjected to temperatures of about 100°C. to about 150°C.

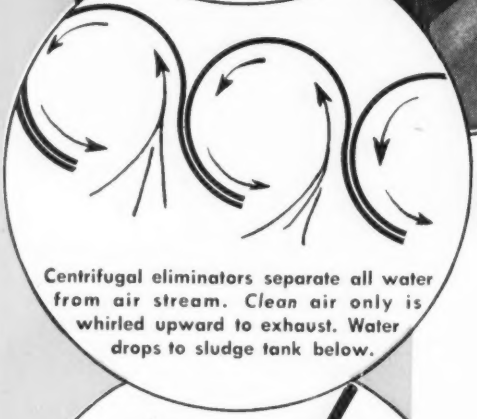
Oil Varnish

U. S. Pat. 2,346,409. G. R. Anderson, assignor to Hercules Powder Co., April 11, 1944. An oil varnish comprising a rosin acid ester of a member of the group consisting of polypentaerythritols alone and polypentaerythritols in admixture with pentaerythritol with the quantity of polypentaerythritol in excess of 25% of the mixture of pentaerythritol and polypentaerythritols, in which the acid groups of the ester consist of abietic acid groups, and a drying oil.

3 OUTSTANDING ADVANTAGES of



Adjustable reservoir construction of gutter above flood sheet insures an even flow of water over sheet, keeping entire surface clean.



Centrifugal eliminators separate all water from air stream. Clean air only is whirled upward to exhaust. Water drops to sludge tank below.

High-pressure, cone-shaped water sprays, projected through circular orifices, thoroughly wash pigment from air stream—provide an effective seal against passage of fire.

MAHON *Hydro-Filter* SPRAY BOOTHS

The Hydro-Filter principle gives to Mahon Hydro-Filter Spray Booths *three* outstanding advantages over conventional types of spray booth construction. *First:* When in operation, it is impossible for a fire generated inside the booth to pass the water sprays and spread through the exhaust system—or from the exhaust system into the booth. *Second:* Pigment, dust and other gummy substances, which normally build up in the exhaust ducts and fan, are removed *before* the exhausted air reaches this part of the system. *Third:* Water spray nozzles are out in the open in plain sight and are readily accessible. There are no *concealed eliminators* that require removal for cleaning. These are only highlights of many superior features of design and construction. Mahon engineers will give you the story in detail . . . will show you how Mahon Hydro-Filter Spray Booths are insuring firesafety, efficiency and economy in the spray painting of every conceivable product from small radio equipment to completely assembled bombers.

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DETROIT 11 — CHICAGO 4

Designers and Manufacturers of Metal Cleaning Machines, Rust Proofing Machines, Hydro-Filter Spray Booths, Ovens of All Types, Filtered Air Supply Systems, Hydro-Foam Dust Collectors—and Many Other Units of Special Production Equipment—Including Complete Finishing Systems.

A. E. S. Conference Notes:

The 32nd annual conference hit the jackpot—and our own *Tom Trumbour,* so far as we could learn, is the only man who has attended *all* of them! . . . *Embarrassing Moment:* When *Art Logozzo* (*MacDermid, Inc.*) went to his room on the train to Cleveland it was already occupied. The occupant claimed the room was his and refused to leave. When the conductor finally came around at about ten-thirty and the occupant got through complaining about nasty people interrupting his rest, it turned out that he had the *right* room but the *wrong* car, so Art got his slightly used room while the noisy individual ran the gauntlet of snickers. . . .

Complaint Department: Every finisher with a complaint about specifications pounced on *Nate Promisel* (*Navy Aeronautical Bureau*). Nate wants it known that he accepts no responsibility for specifications which do not originate in his department. Why did you disappear, Nate, when Congressman Hartley started talking about bureaucrats and crackpots in Washington? He wasn't referring to you! . . . Wyandotte tells us that their F-100 cleaner (free plug) is good for roaches too. Why do people have to get personal? . . . Everyone complained about the heat but *Ted Eichstadt* (*Michigan Chrome*) did something about it—he ambled around the hotel with neither coat nor tie. With his beard he was just about the only one there who could still look dignified that way. We came down wearing an open-neck shirt and a sport jacket and the New York hecklers' club consisting of *Martin Maher* (*Etched Products*), *Duncan Copland* (*American Bank Note*), *George Schore* (*Federal Telephone & Radio*) and *George Herrmann* (*W. L. Maxson*) ganged up on us.

Covering Our Beat:

Phil Ritzenthaler (*Cutler-Hammer*) has his own personal blood bank. Whenever we saw Phil, *Bill Geissman* (*Allis-Chalmers*) was nearby. Bill, we believe, holds the record in our industry with thirteen pints donated to the Red Cross. . . . And all the time we thought our measly nine pints were something to brag about.

Horace Smith (*Surety Plating*) doesn't like to use a ball microphone—might mistake it for a lollypop and put it in his mouth probably. It seems that the Ladies Auxiliary of the Newark Branch was maintained to provide a labor reserve for the Branch members. . . . *Mrs. Smith* and *Mrs. Ed. Washburn* have been drafted into the plating room by Horace and from now on whenever *Ed. Washburn* (*Walter Kidde*) starts talking shop, Mary will be able to get right back at him.

John Feeley (*Montreal*) put forth his best arguments in favor of changing the name of the A. E. S. but didn't succeed. We venture to say, however, that, had he put on a War Bond drive, the delegates present would have emptied

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DETROIT 9

their pockets for him. The man just radiates sincerity and good humor!

The Awards Committee had its problems too, due to the general excellence of the entries, but we do not believe anyone could find fault with their choices. Honorable mention for a paper on caustic black finishes, published in the Monthly Review by a member, was awarded to *Jerome Black*, which is probably the first time in the history of the Society that an award was made to a member who was unable to take a bow because of use of a pen name.

George Hogaboom took another first prize—for his individual hobby exhibit consisting of old metal finishing items and literature. He arranged the exhibit himself and, of all the first editions, only one book was arranged upside-down —his own!

Dr. Bloom (*M. I. T.*) and the custodian of this department went touring through the rooms Tuesday night and ran across "*Manny*" *Cohan* (*Cohan-Epner*) resting his feet. He was politely requested to empty his pockets and, as we suspected, they were full of some excellent examples of plated plastics. We hope he removed them before getting on the boat to Detroit because, if he ever fell overboard with his pockets loaded like that, he would sink like a rock.

Max Galfunt (*Hudson Chromium*), the optimist, left for the airport at 4 P. M. on the last day to return to New York. To make him feel better, we told him about *Joan Trumbour* getting kicked off the plane at Cleveland five minutes before take-off by a traveller with a Number Four priority, a few months ago. He showed up at the hotel some time later and finally went home by train.

Banquet Night:

We formed a committee of three with *Duncan Copland* and *George Schore*, stationing ourselves near the hotel desk and collecting banquet tickets from those who were checking out early. We then brought these tickets over to the railroad station and handed them out to the sailors hanging around the Shore Patrol booth. Some of the diners, seeing the sailors, were probably wondering whether plating is really a critical occupation, as they had been led to believe.

"*Liquid Sulfur*" *McKeon* came away with a lovely prize. (Them as has, gits!) . . . The ballroom wasn't hot enough, so they turned on the photoflood lamps and took motion pictures. . . . The ballroom and adjacent Red Room could hold only 800 diners so the overflow mob had the privilege of ordering anything on the menu in the various air conditioned hotel dining rooms at the Society's expense to console them for their inability to sit with the crowd. This, in our estimation, was an excellent solution for what might have turned out to be a real headache, and for which the committee deserves a good deal of credit.

After the banquet, the tables were cleared away and the seats rearranged so that everyone could see the show. Wonder if *Prof. Mathers* (*Indiana U.*) will ever sit in the front row again. One man down front was pointed out by *Dr. Blum* (Do we have to identify HIM too?) as a perfect double of *George Hogaboom* from the rear. In the contest which involved fastest removal of her partner's undershirt, one girl would have won but for the fact that her partner wasn't wearing any. Luckily, no one was wearing a union suit. All things considered, the conference was most enjoyable but we're glad the next one is a year away.

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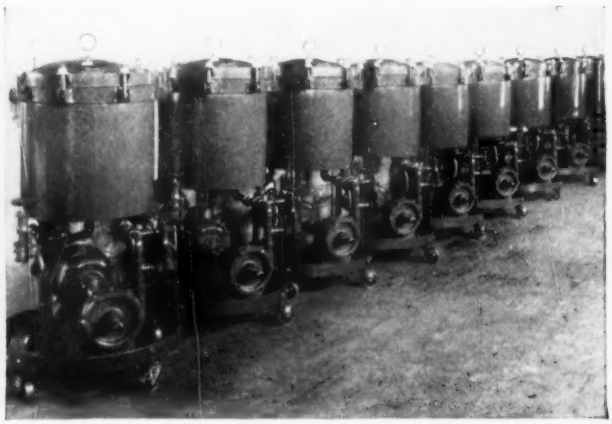

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